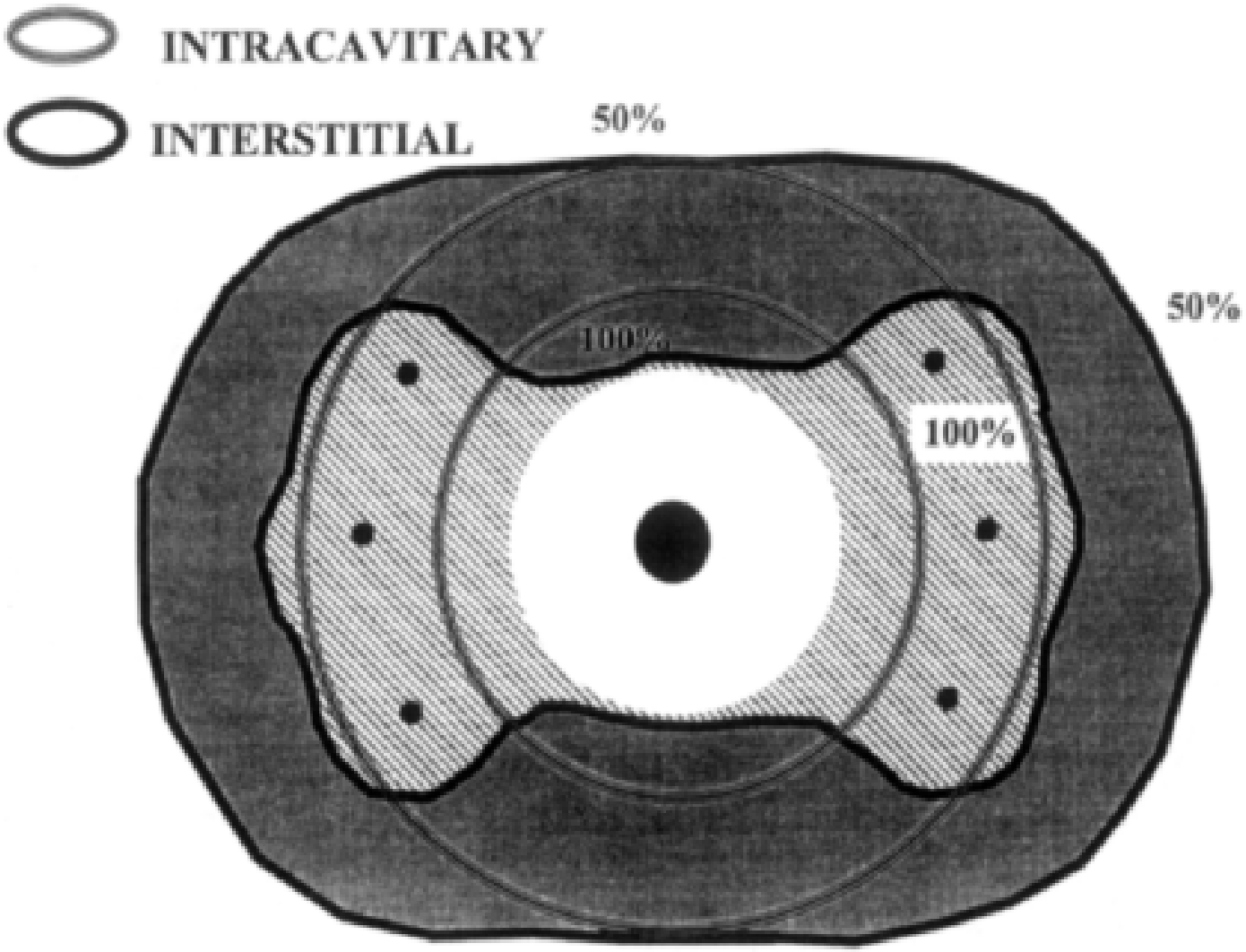
INTERSTITIAL BRACHYTHERAPY FOR GYNECOLOGICAL MALIGNANCIES

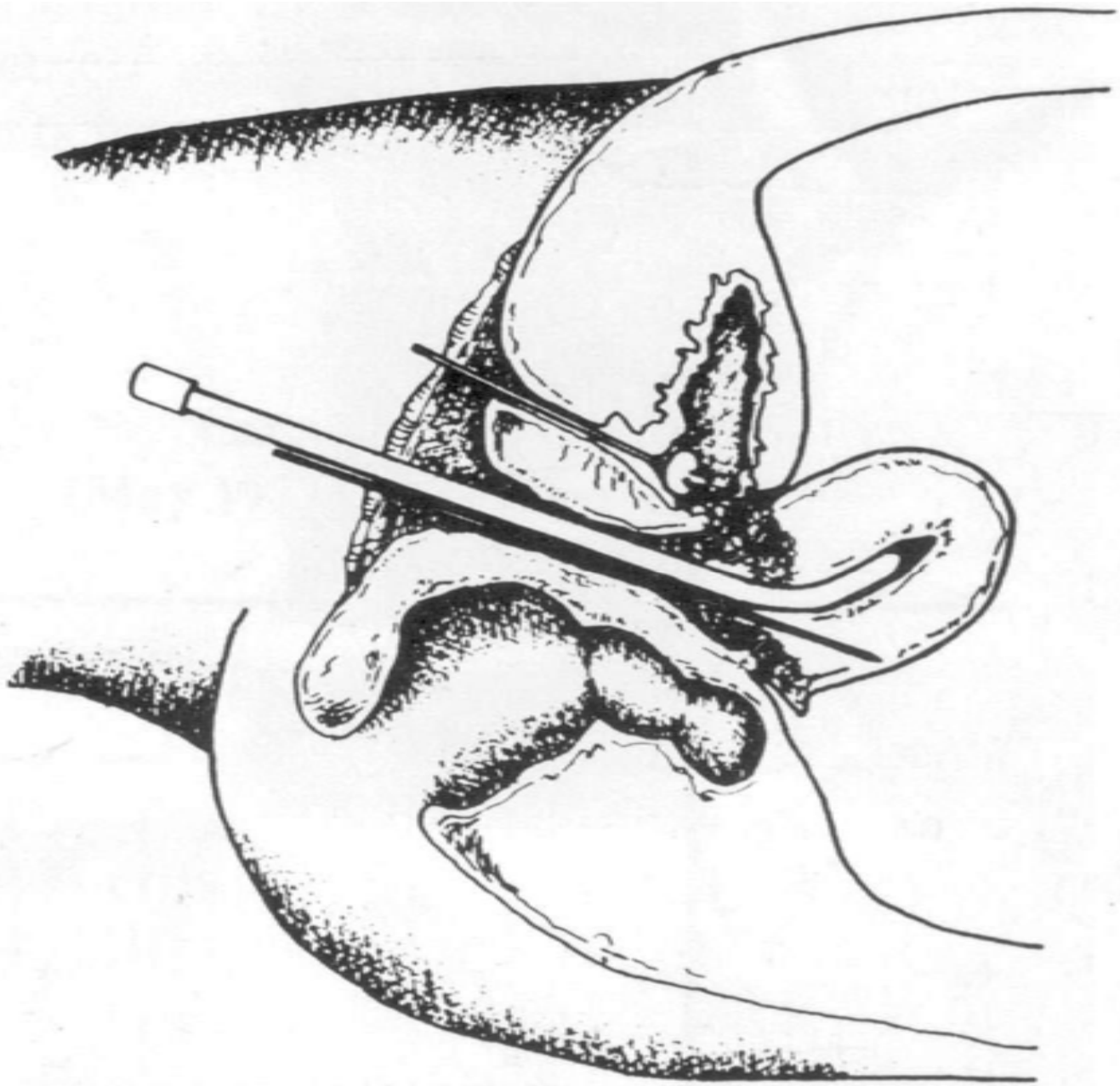
DR SANJIV SHARMA

MANIPAL HOSPITAL

BANGALORE

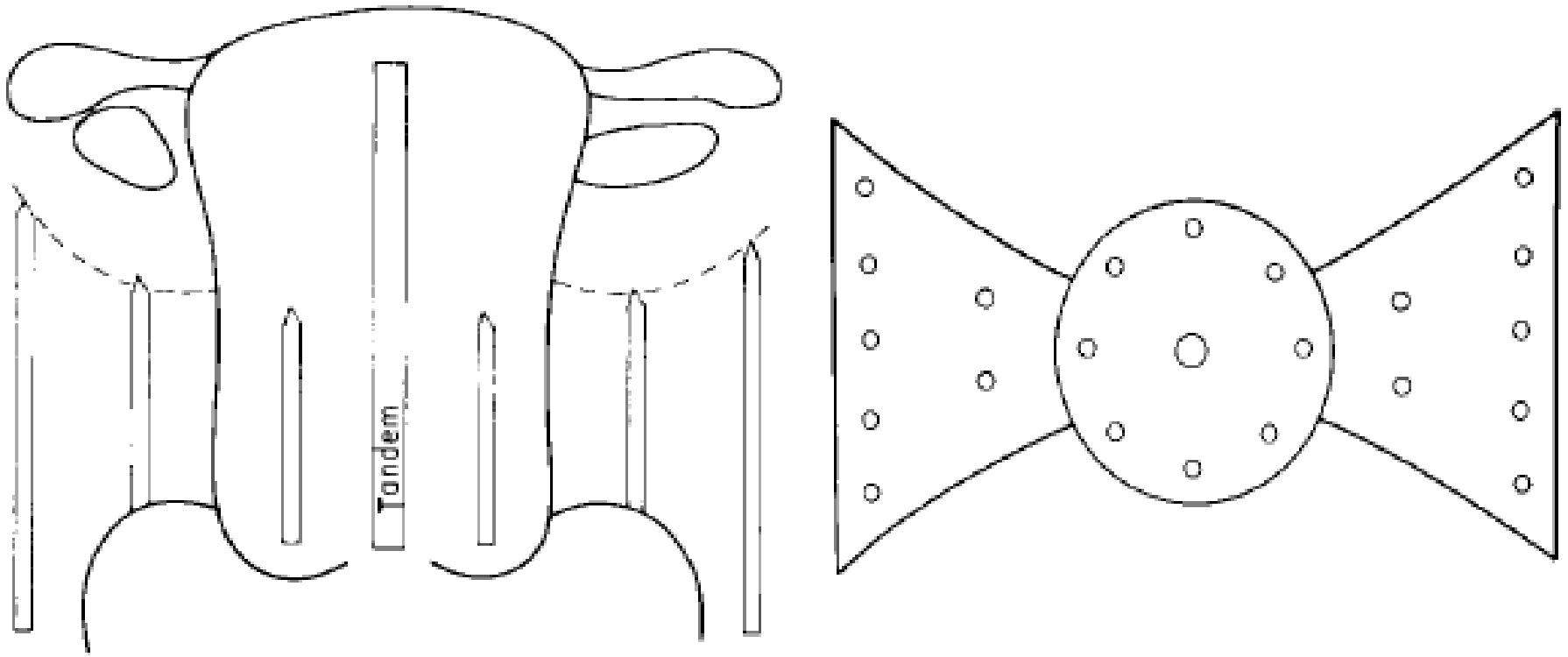
RATIONALE





1–4, 3–6, and 1–6) (Figs. 1 and 2). The planned depth of needle placement in the parametrium was determined by the cranial extent of HR-CTV, usually 3 to 4 cm above the upper ring surface, with an appropriate margin (an extra 5 mm was added to account for the inactive end of the needle tip). In some patients, the number of needles placed in the parametria was changed after the first application to tailor the dose distribution to the critical organs.

RATIONALE



Corscaden et al 1948

INDICATIONS

- **Extensive parametrial involvement**
- **Narrow or distorted vagina**
- Bulky primary disease
- Distal vaginal involvement
- Inability to insert tandem
- Post operative vault recurrence / cut through hysterectomy / cervical stump presentation
- Prior radiation therapy to pelvis
- Persistent disease after XRT and intracavitary

- Extensive vaginal involvement (>5mm thick)

ABS Recommendations Red J. 2002

INDICATIONS

- **Extensive parametrial involvement** which cannot be encompassed by standard intracavitary brachytherapy
- **Narrow or distorted vagina** not allowing use of appropriate vaginal applicators
- Prior hysterectomy
- Prior radiation therapy to pelvis

- Primary vaginal cancer when paravaginal extension cannot be covered by intracavitary brachytherapy
- Vaginal recurrences of endometrial cancer > 5 mm thick

GEC ESTRO Recommendations 2002

TECHNIQUES

- Template based

  <u>Transperineal</u>

  → Syed Neblett

  → MUPIT

  <u>Transvaginal</u>

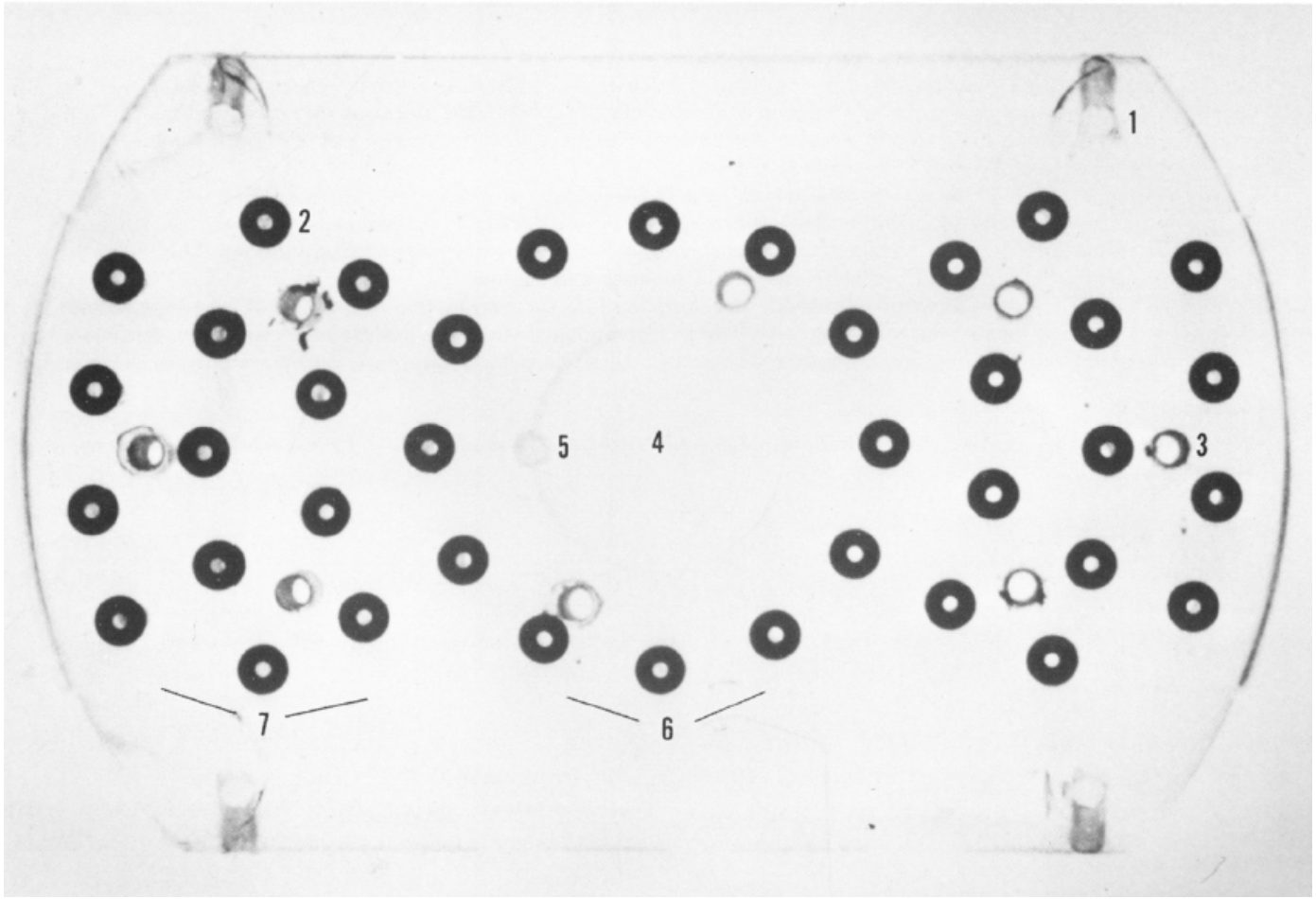
  → Vienna applicator

  Customized

- Free hand

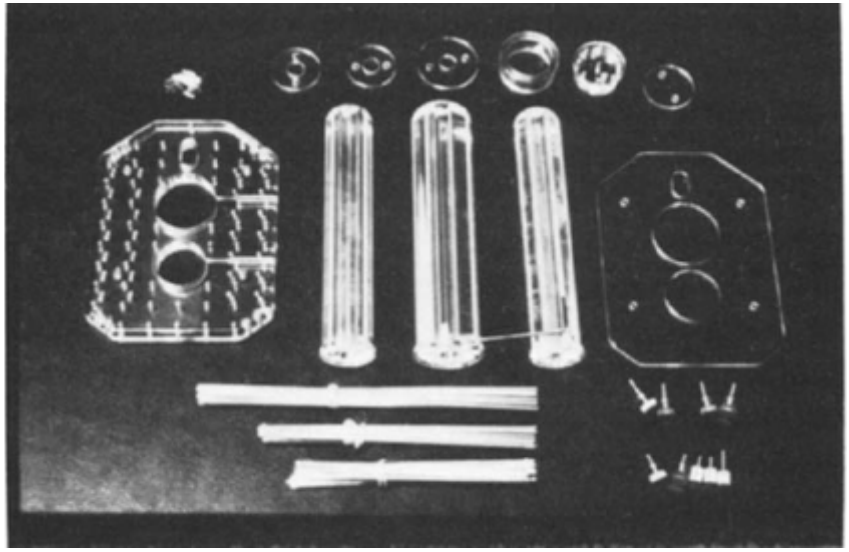
<u>Ovoids (AP) replaced by interstitial needles (CC)</u>

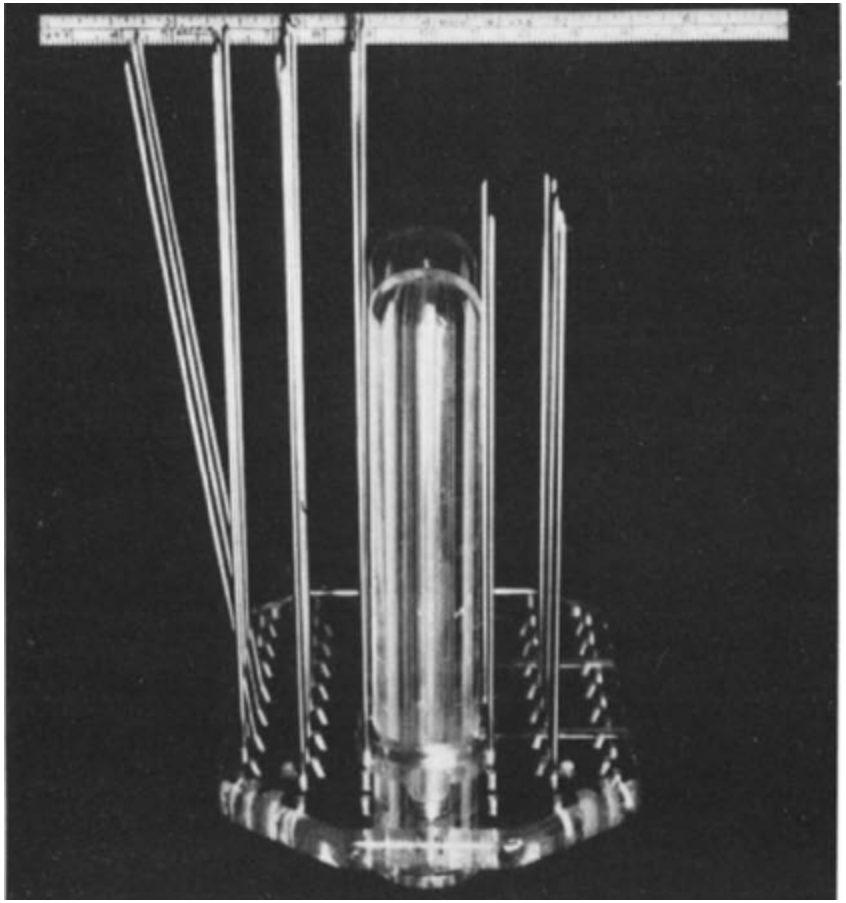
SYED NEBLETT TEMPLATE



CIRCULAR ARRAY OF PERPENDICULAR HOLES
NEEDLE DEPTH DETERMINED UNDER DIRECT VISION

MUPIT



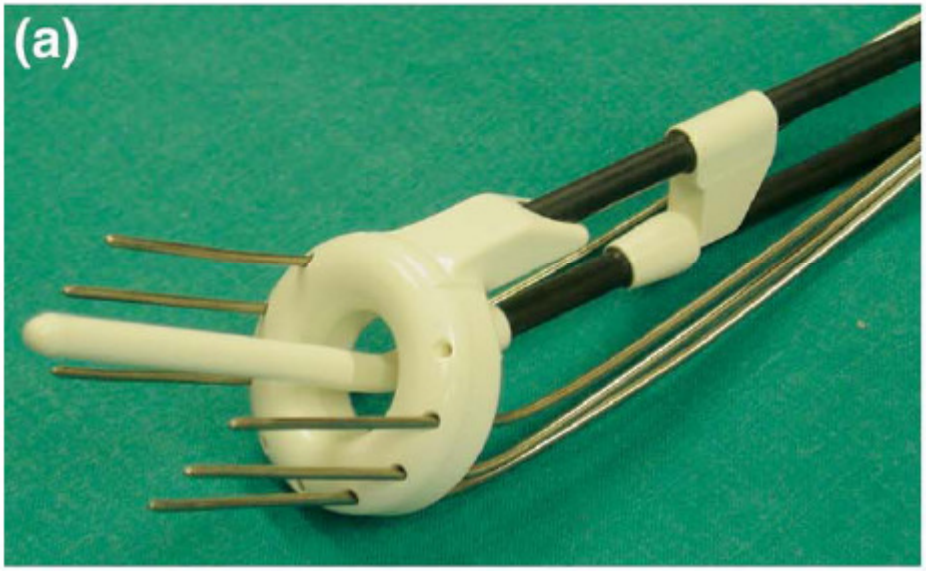


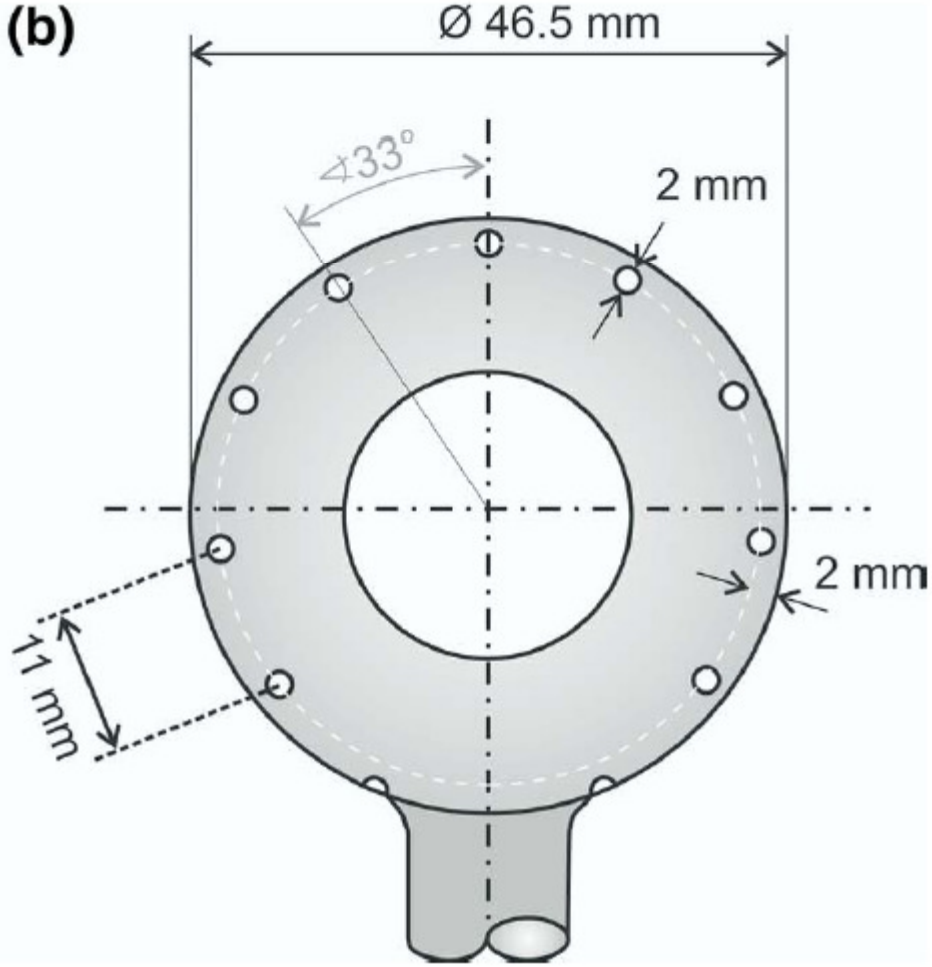
VAGINAL AND RECTAL CYLINDERS
PERPENDICULAR & OBLIQUE HOLES
PREPLANNING BASED NEEDLE DEPTH & ARRANGEMENT

THE VIENNA APPLICATOR FOR COMBINED INTRACAVITARY AND INTERSTITIAL BRACHYTHERAPY OF CERVICAL CANCER: DESIGN, APPLICATION, TREATMENT PLANNING, AND DOSIMETRIC RESULTS

CHRISTIAN KIRISITS, SC.D., STEFAN LANG, M.SC., JOHANNES DIMOPOULOS, M.D., DANIEL BERGER, M.SC., DIETMAR GEORG, PH.D., AND RICHARD PÖTTER, M.D.

Department of Radiotherapy and Radiobiology, Medical University of Vienna, Vienna, Austria

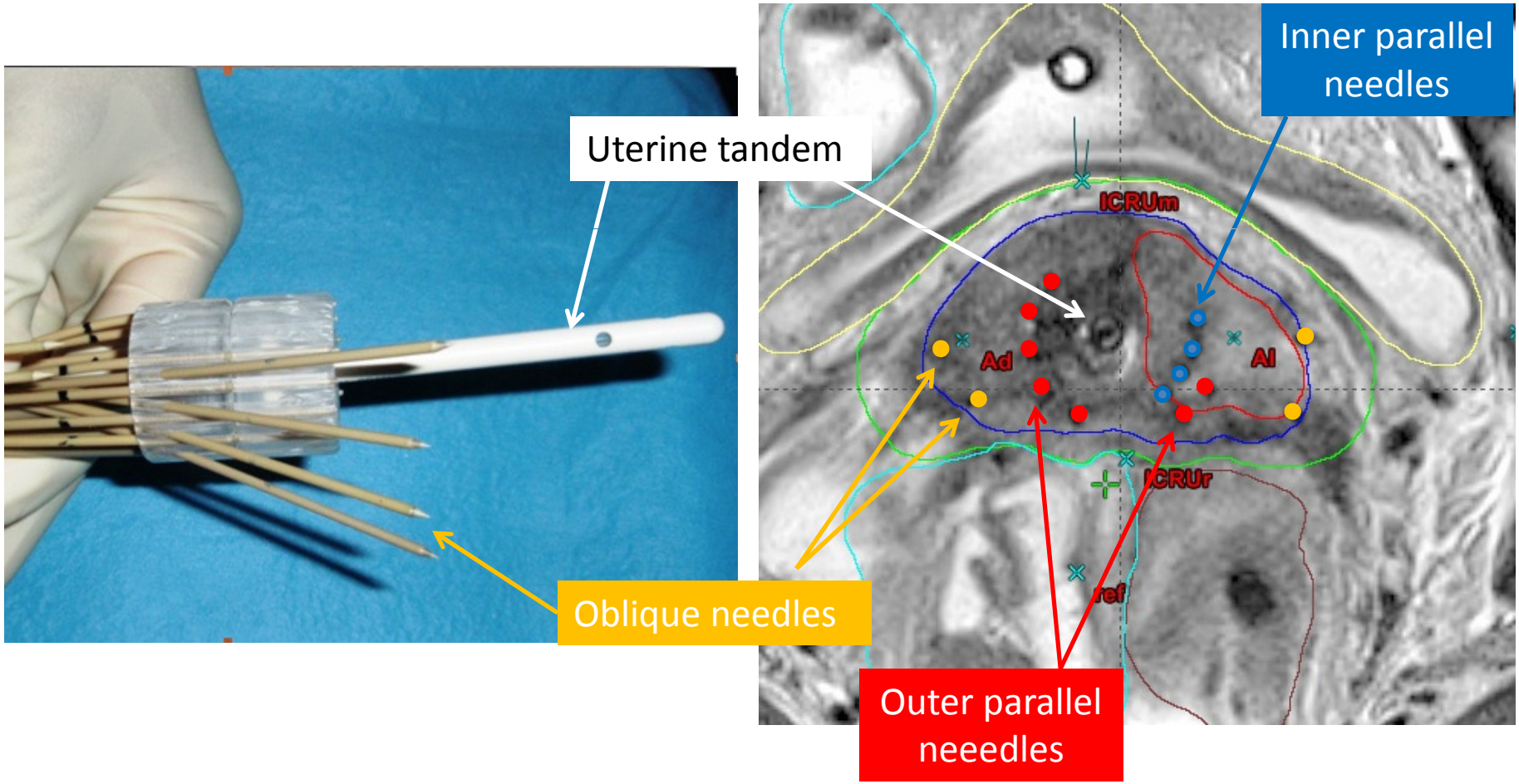




Vaginal extension not covered

? Suitability for Indian patients

Prototype applicator with the possibility of parallel and oblique neddle insertion



DEFICIENCIES

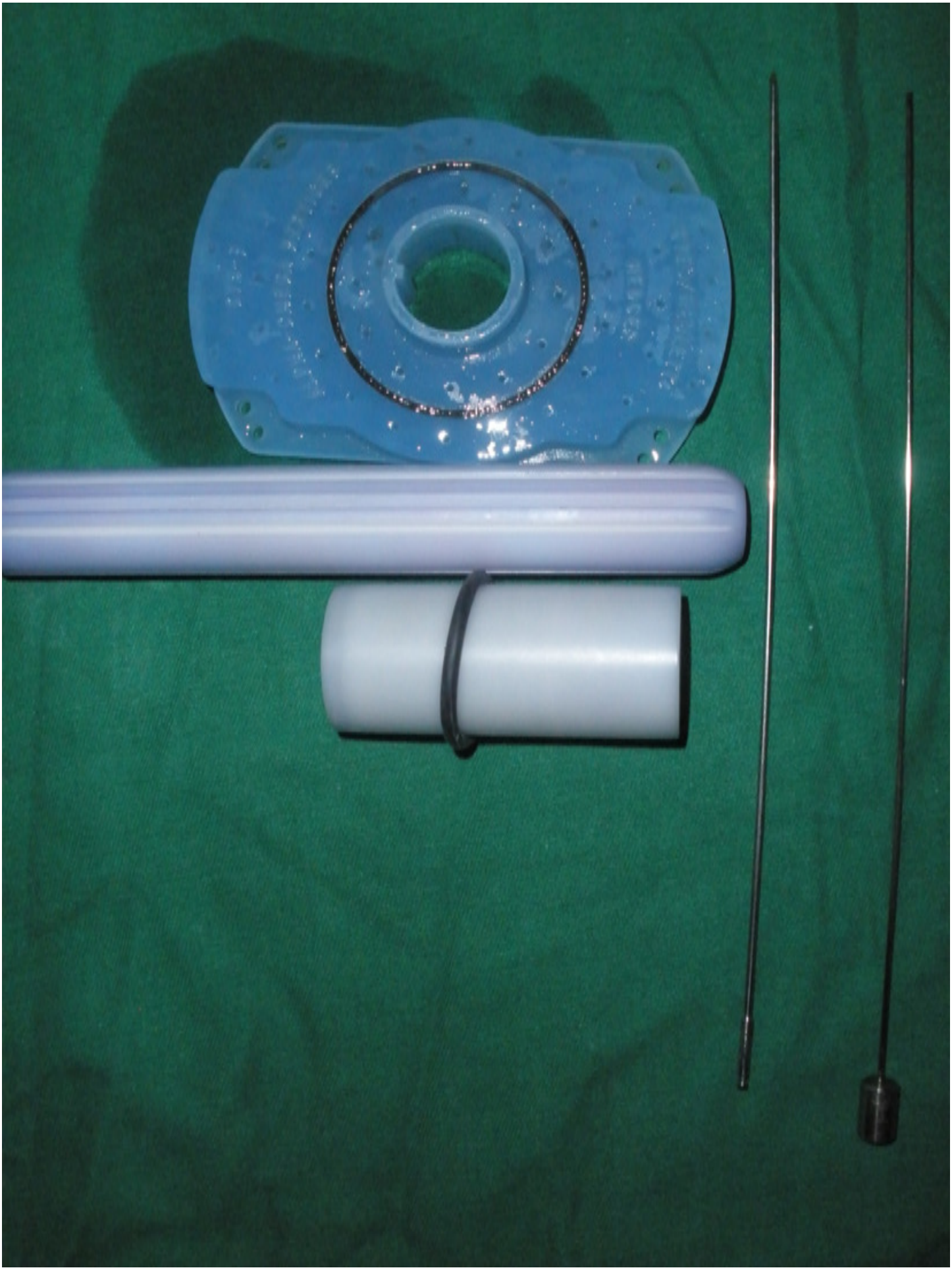
- Lack of accurate identification of the target and OAR
- Lack of knowledge of their relationship to the implant
- Inability to accurately assess doses they receive

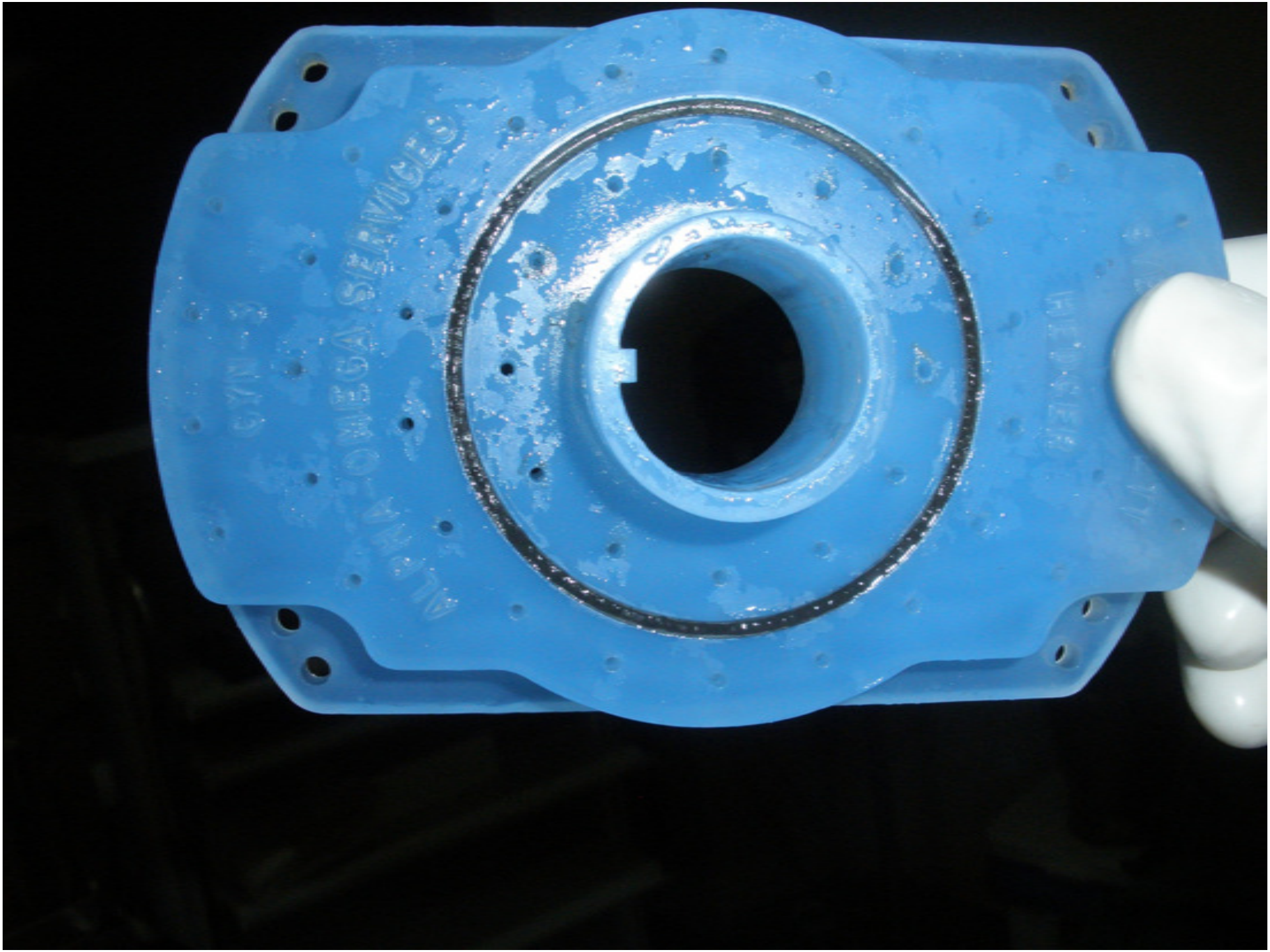
- Guidance
- Preimplant imaging → Customized templates
- Postimpalnt imaging → Assessment of dose
- HDR → Optimization

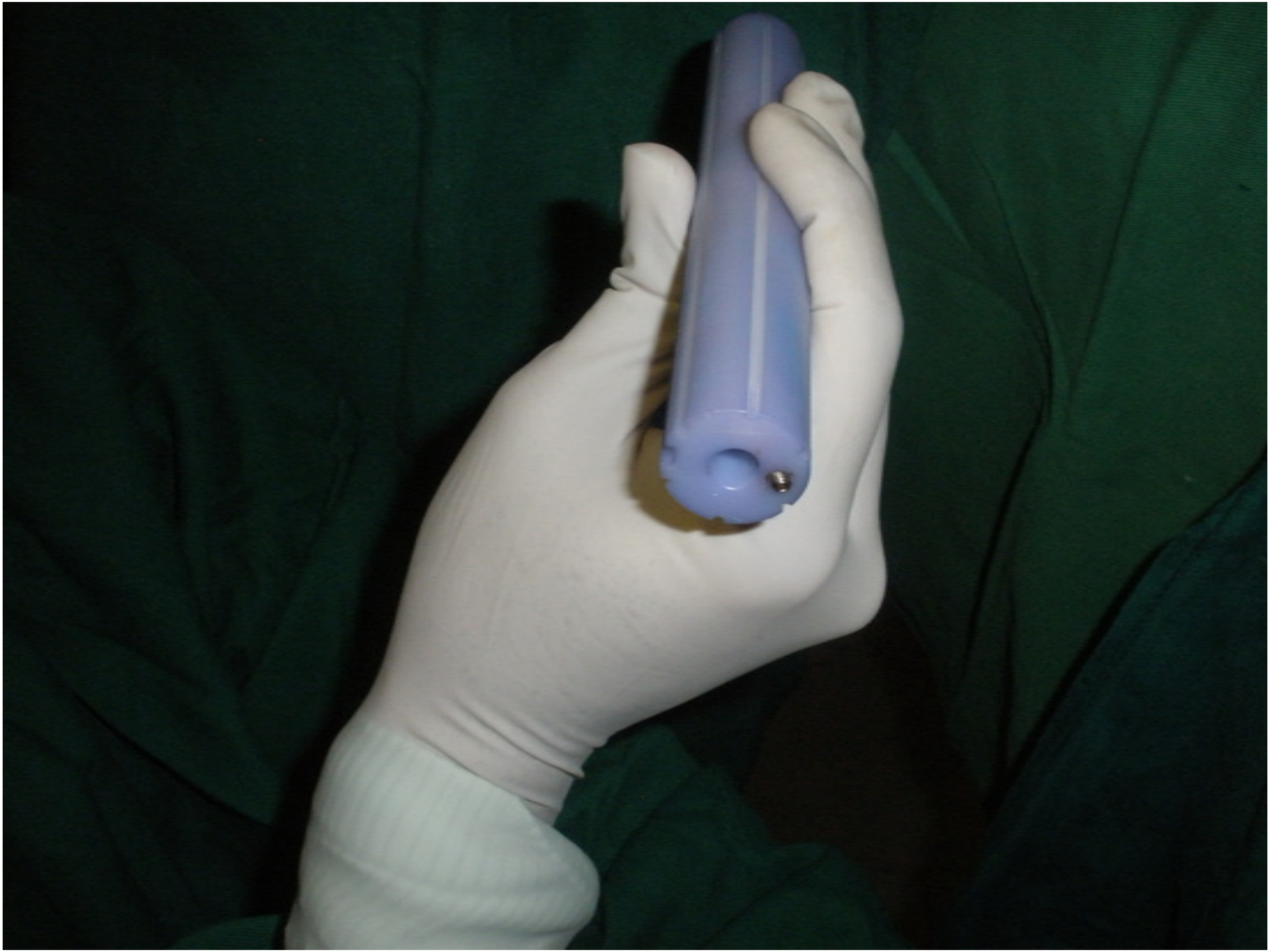
GUIDANCE

- Visual
- Fluoroscopy
- TRUS
- CT
- MR
- Laparoscopy
- Laparotomy
  - → Procedure time increased
  - → Potentially fewer needles may be inserted

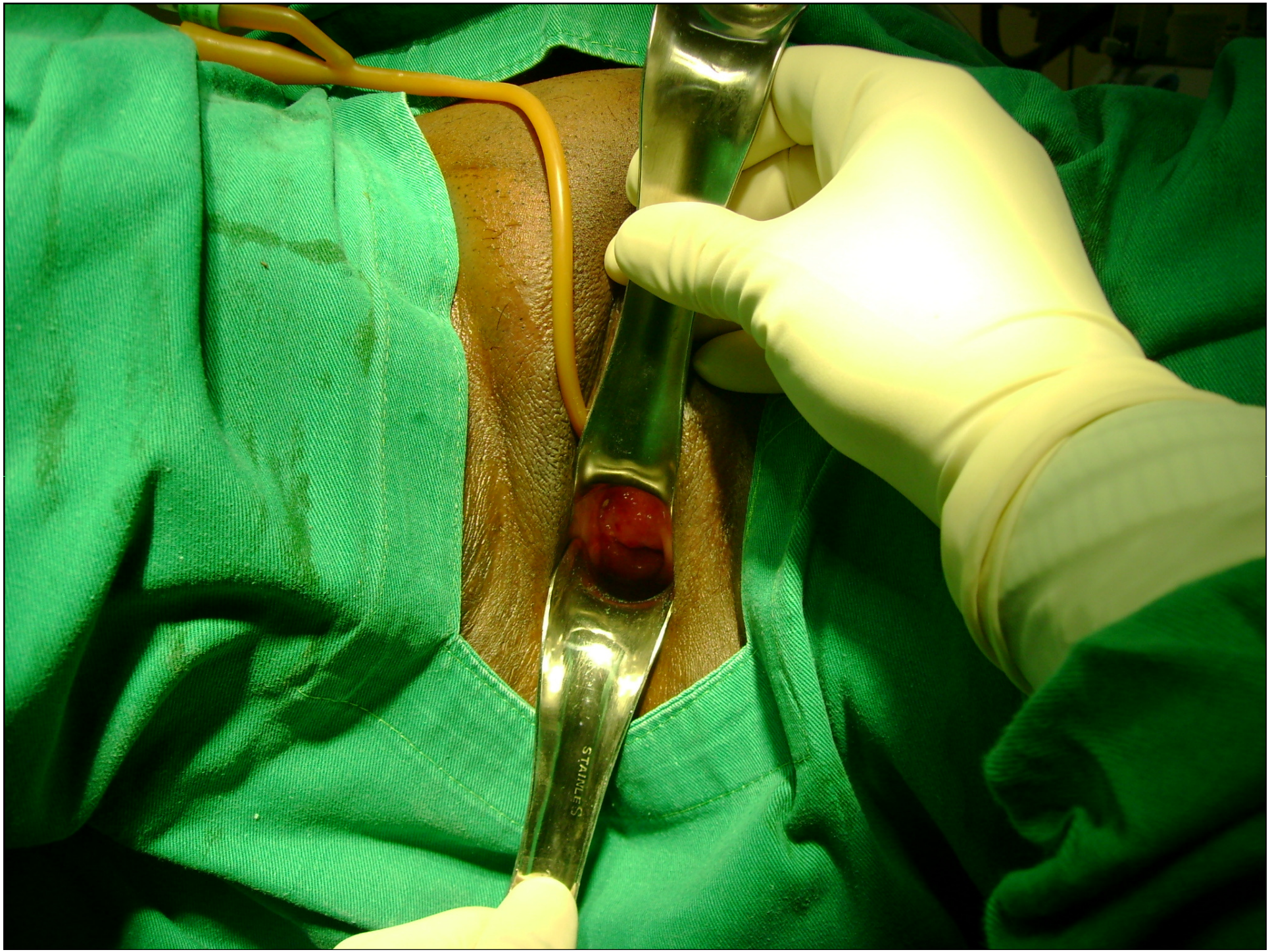
To optimize implant parameters (depth, obliquity, location)

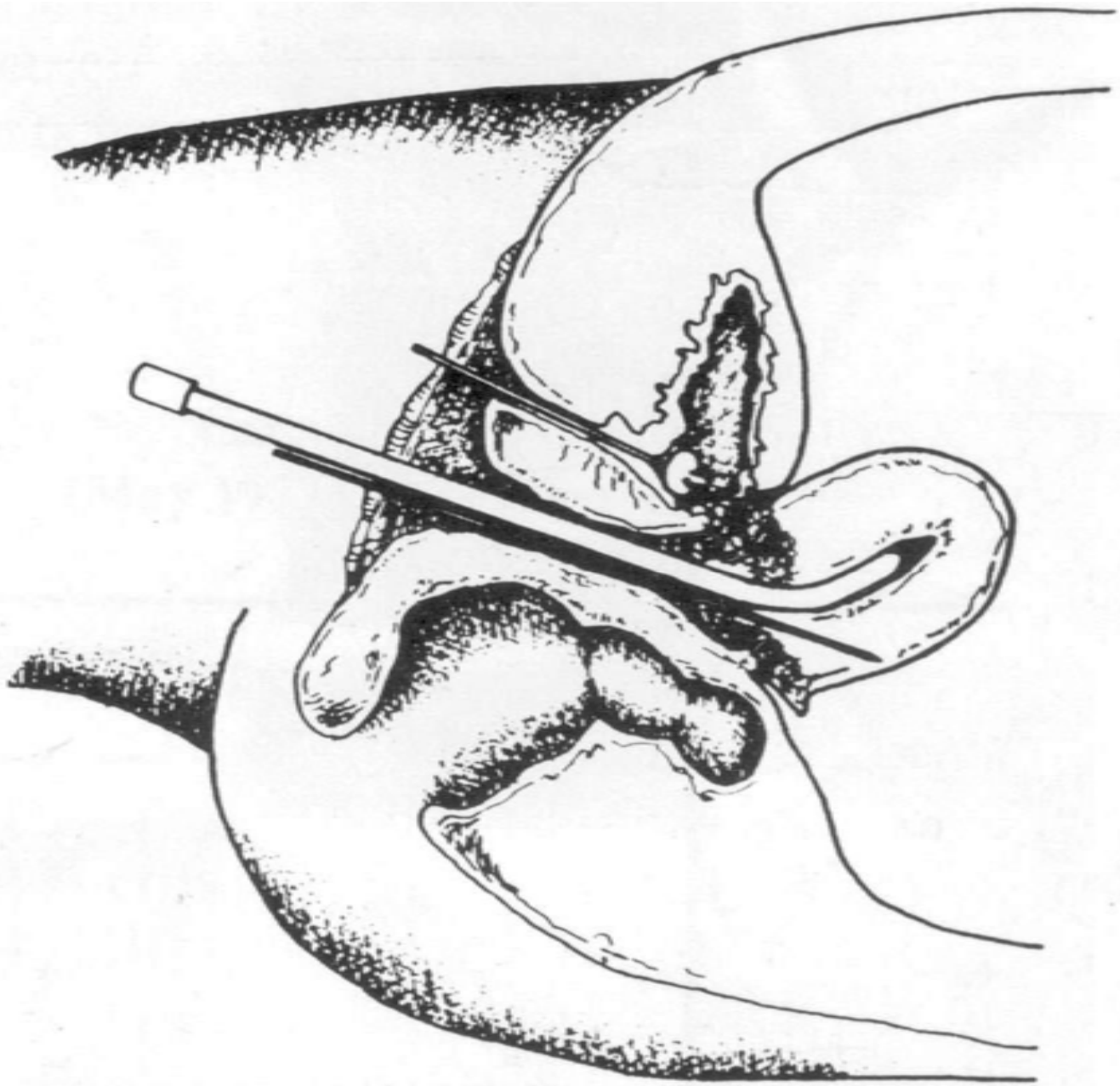


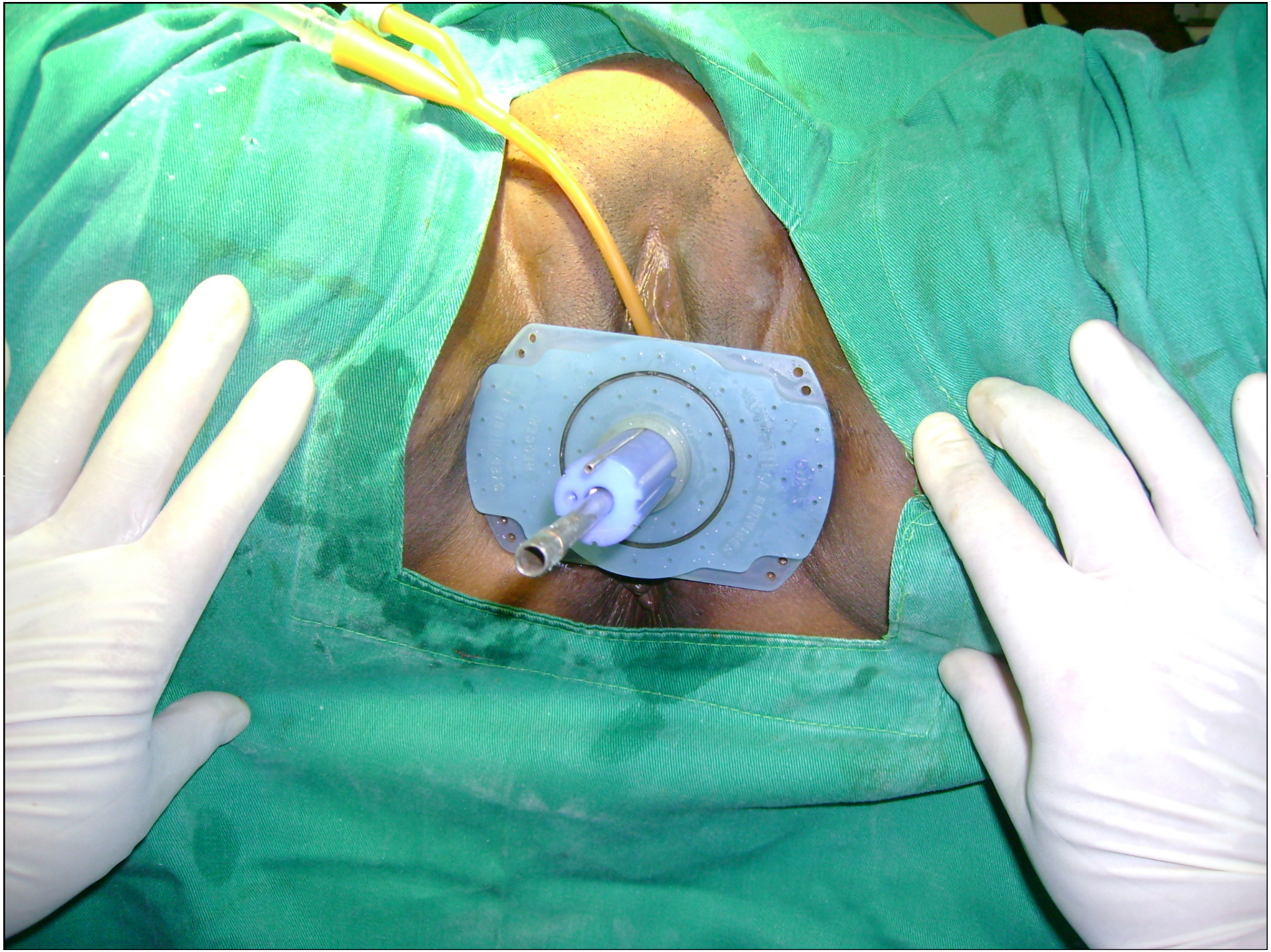

OMEGA SERVICES
ALPHA

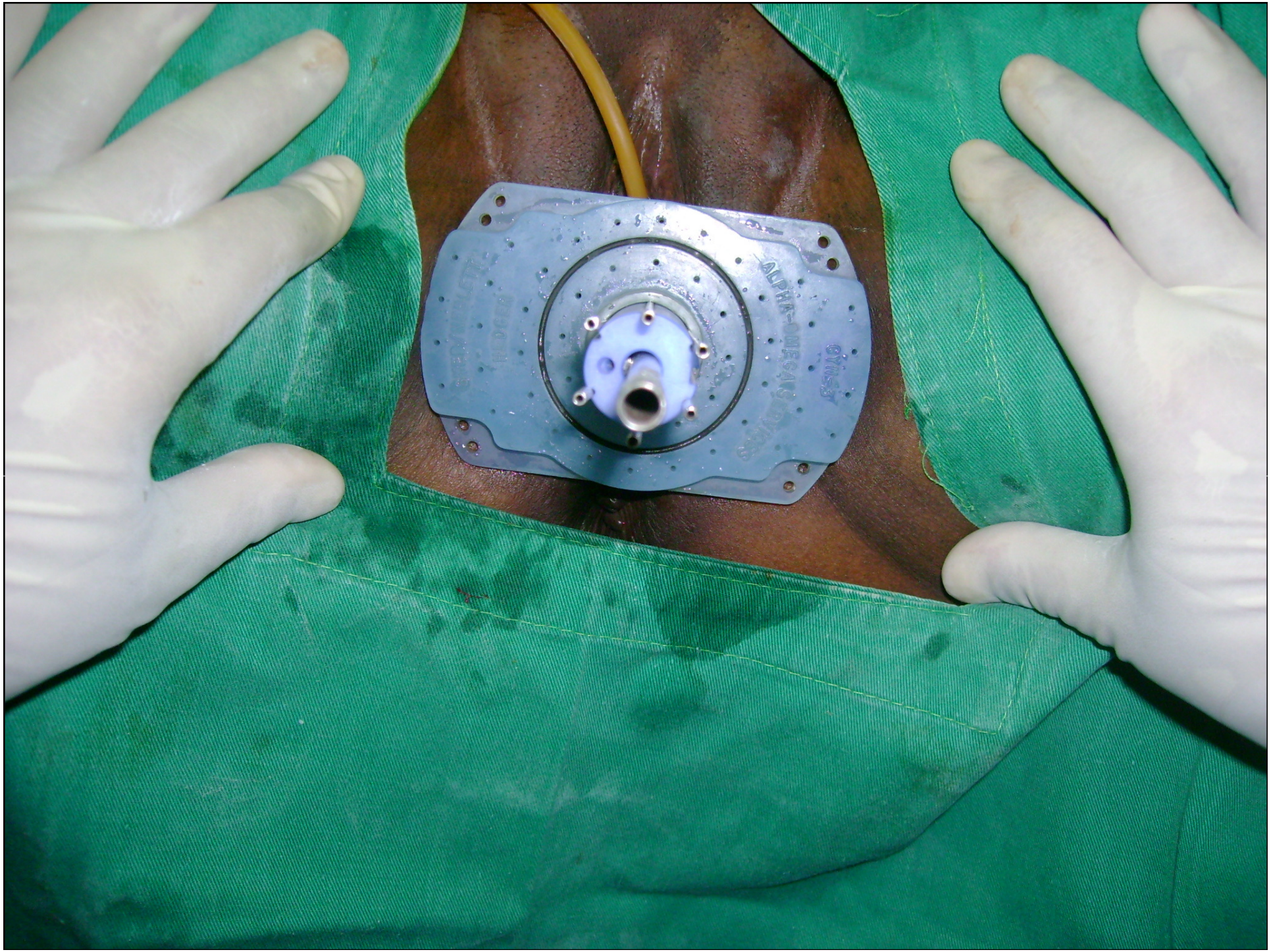


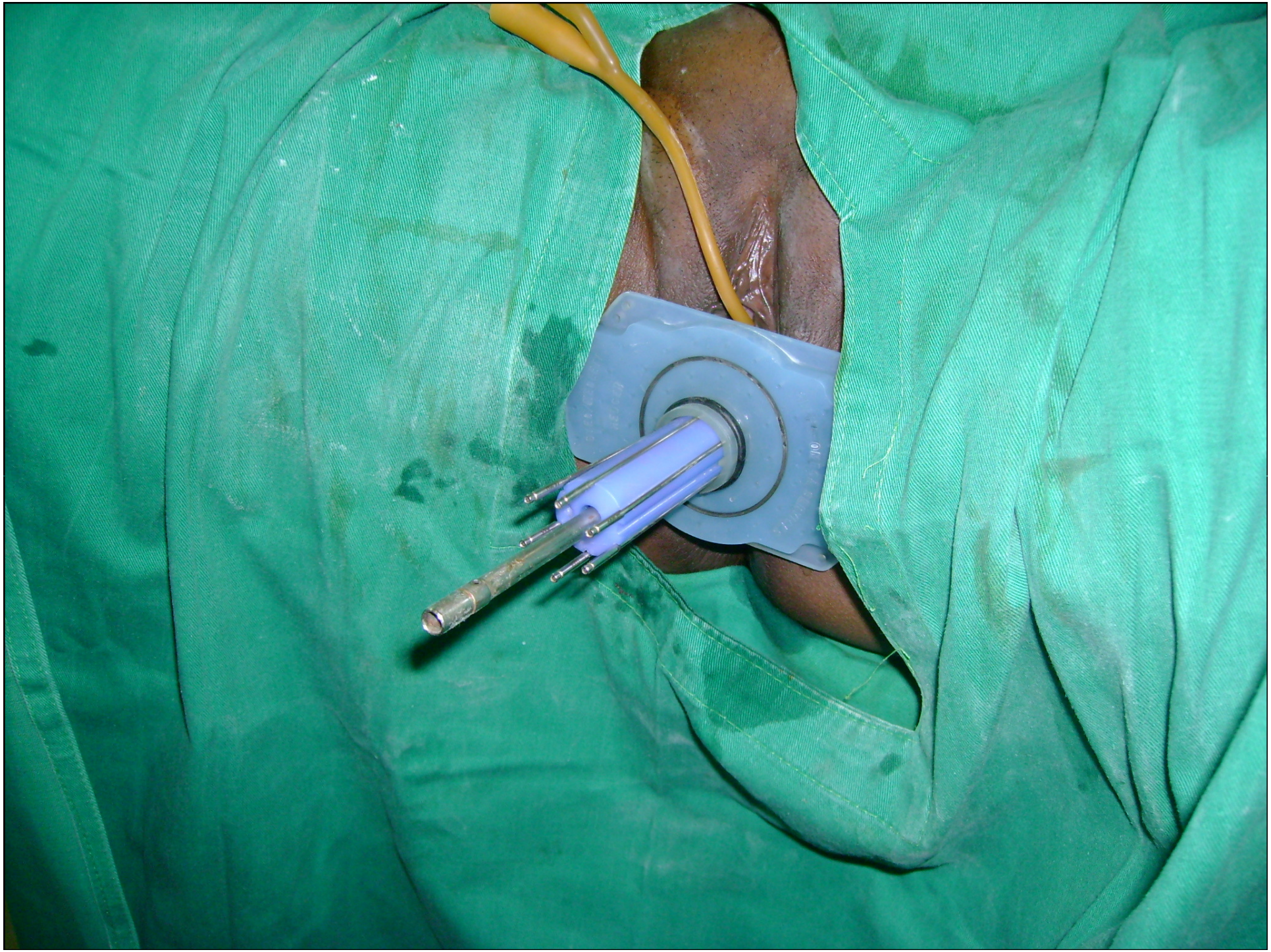

15 8:47

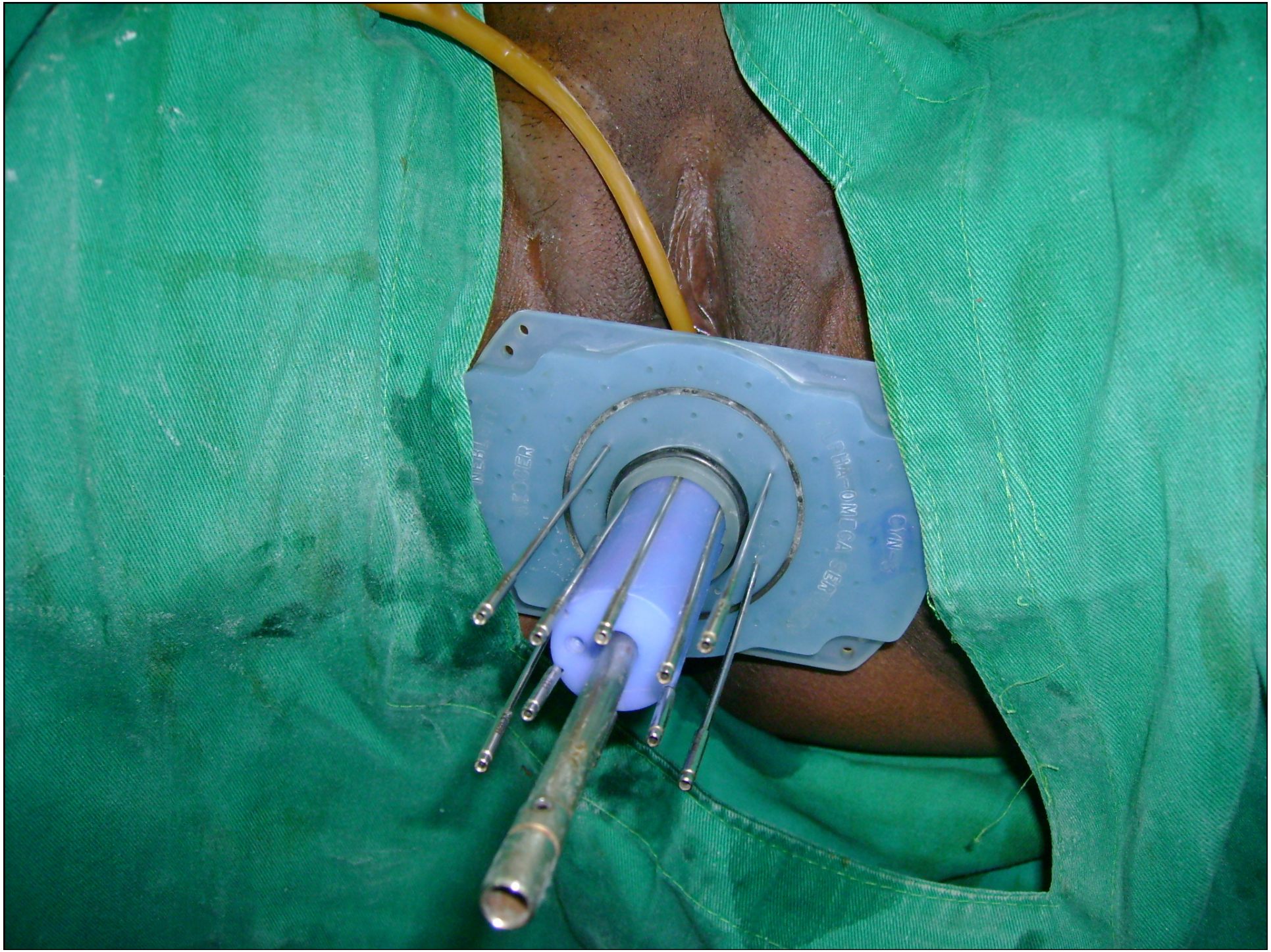

STAINLESS

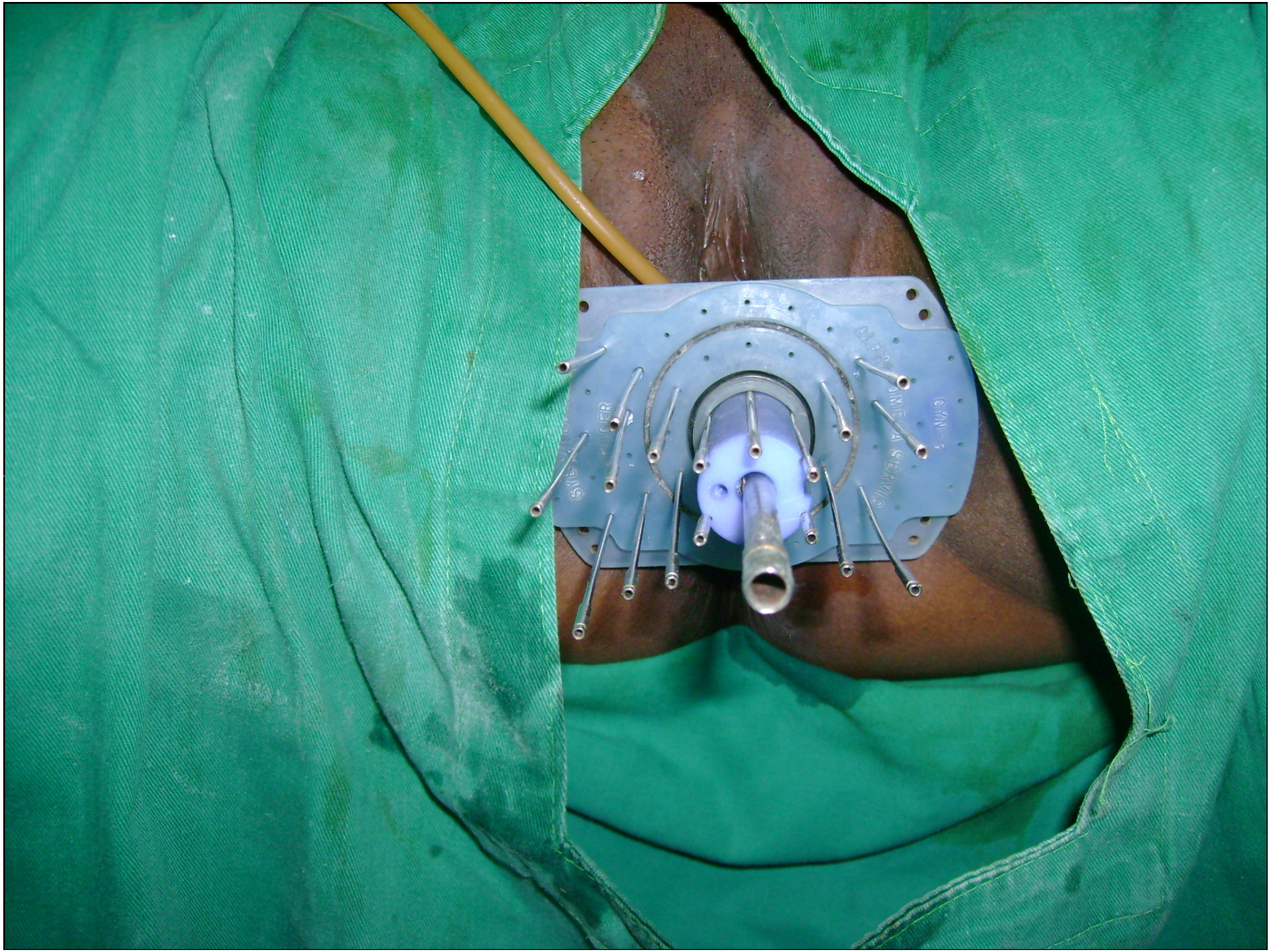


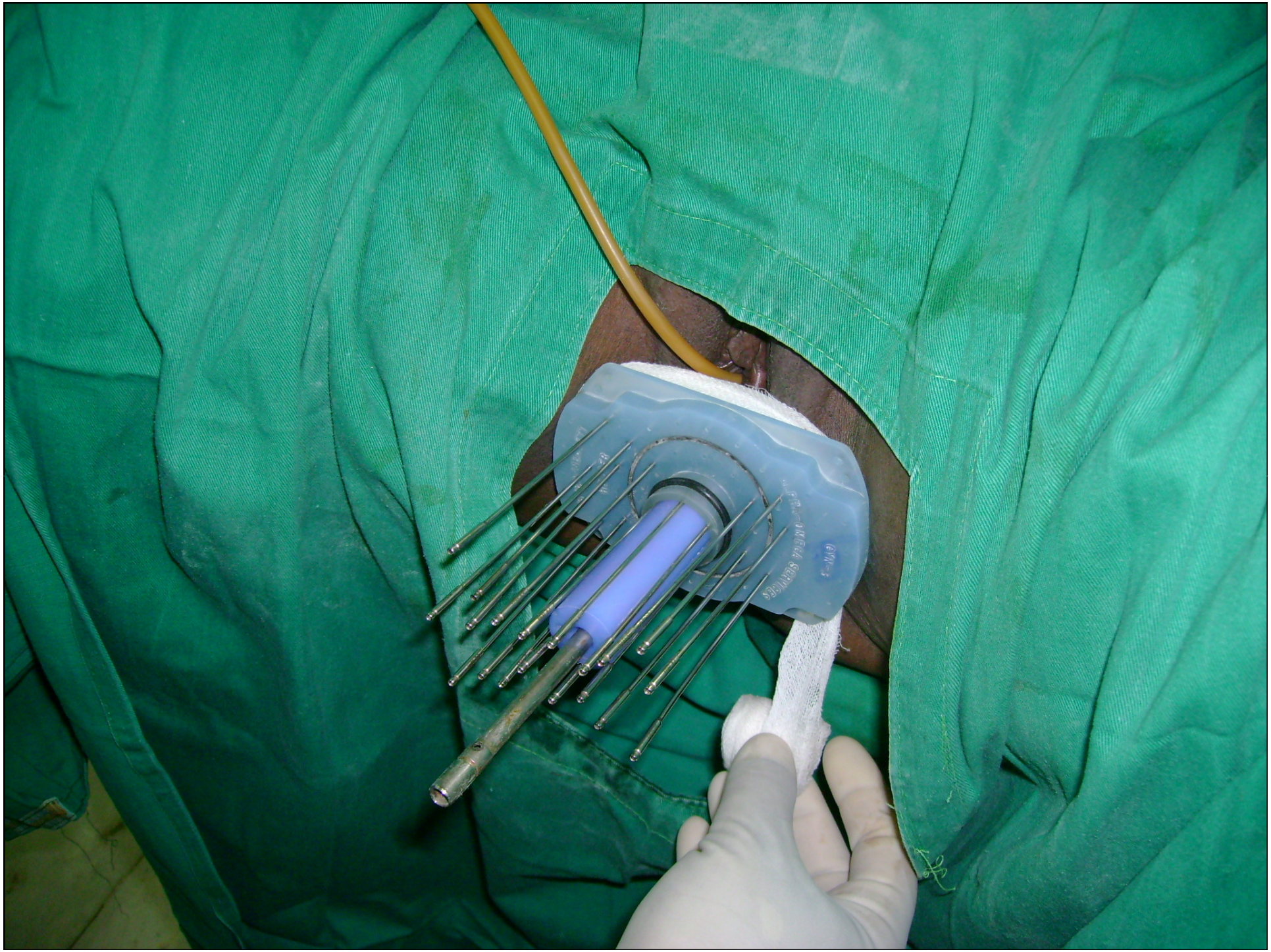


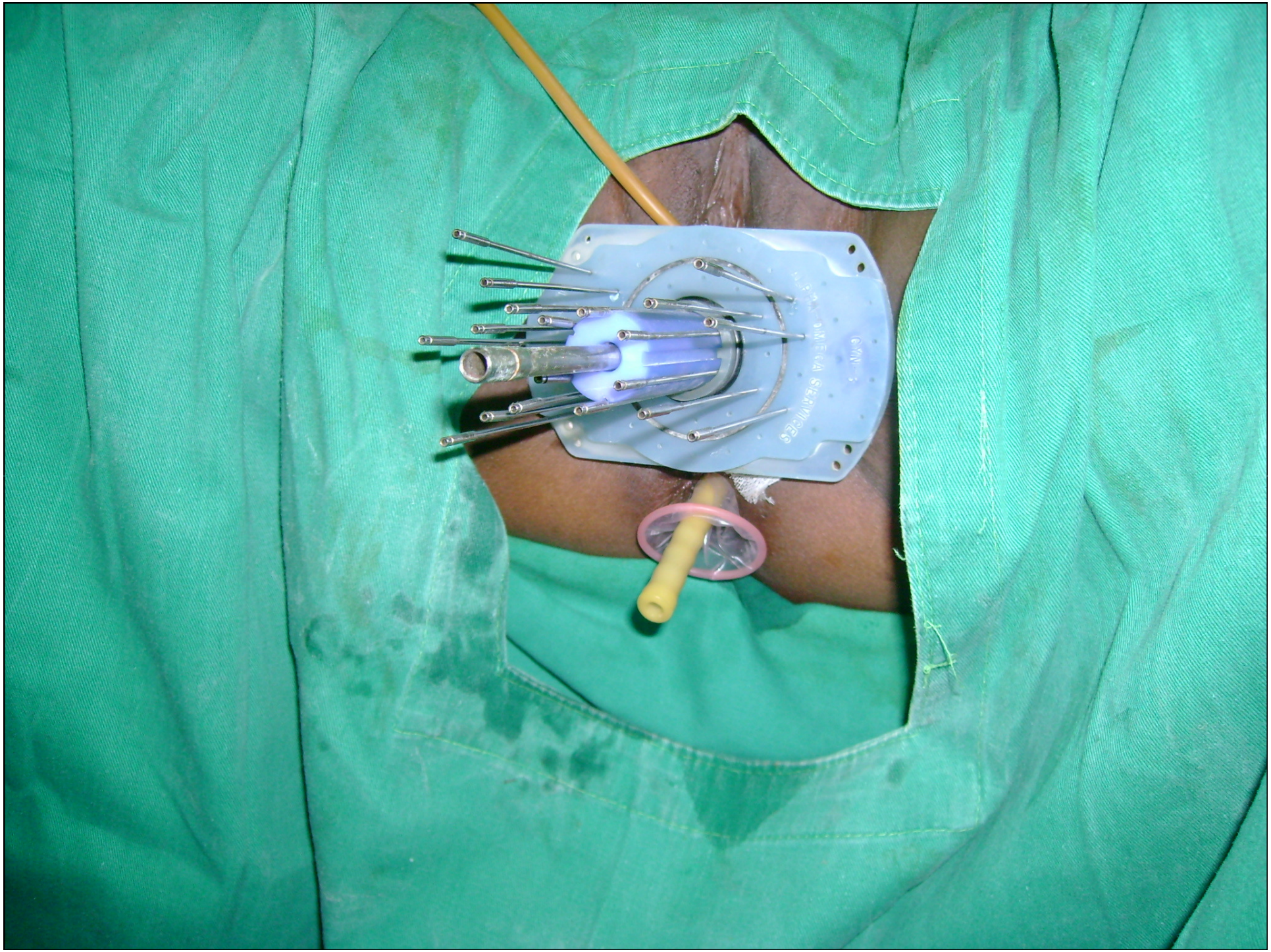

ALPHA-OMEGA

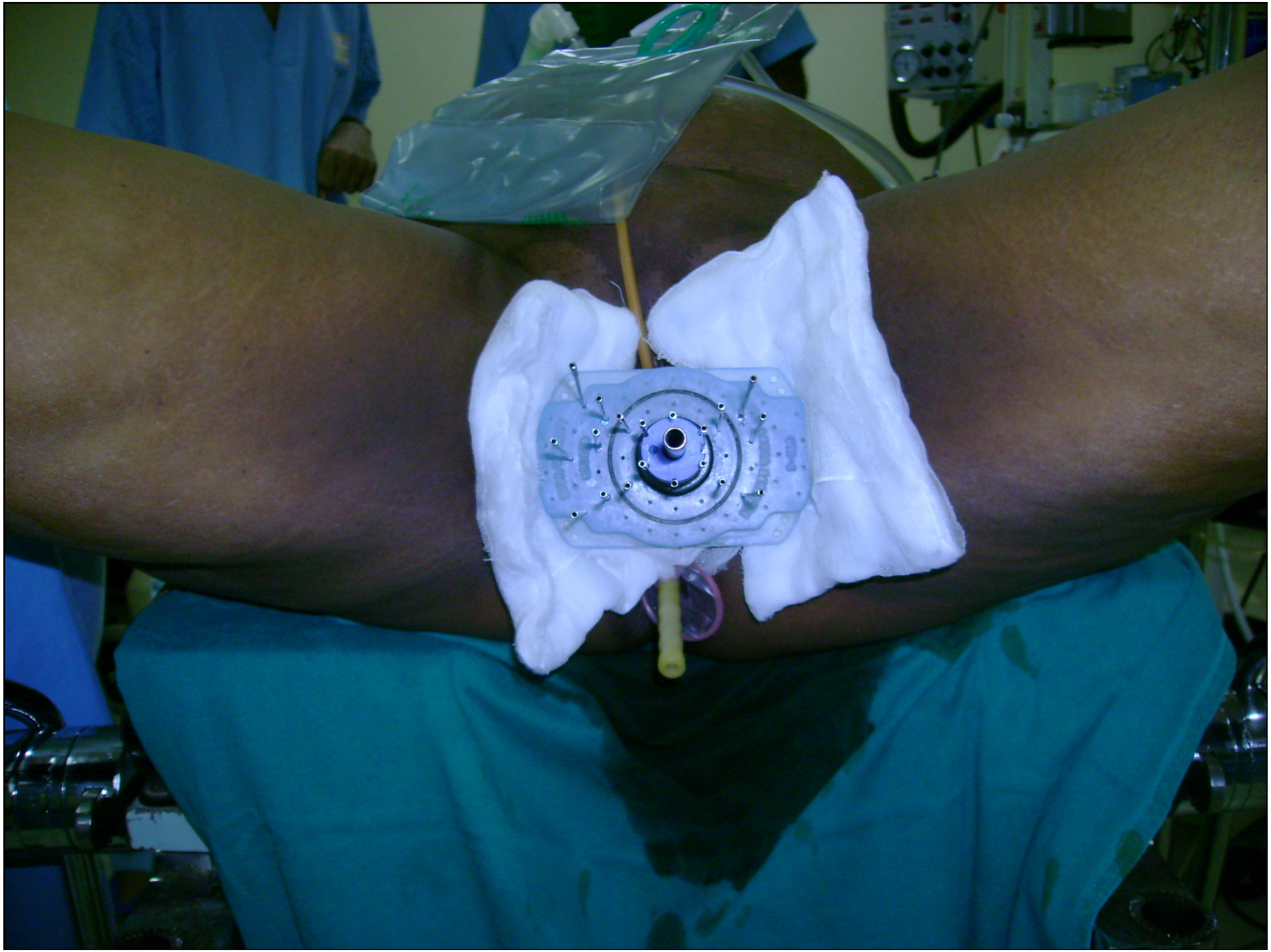












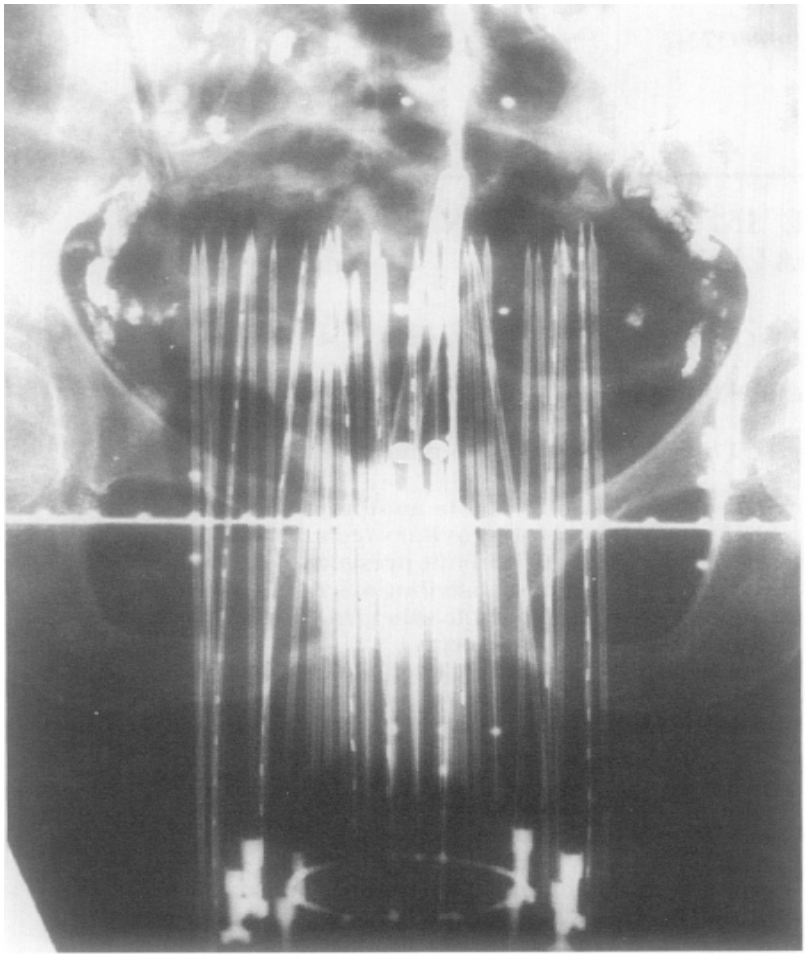
DOSIMETERY

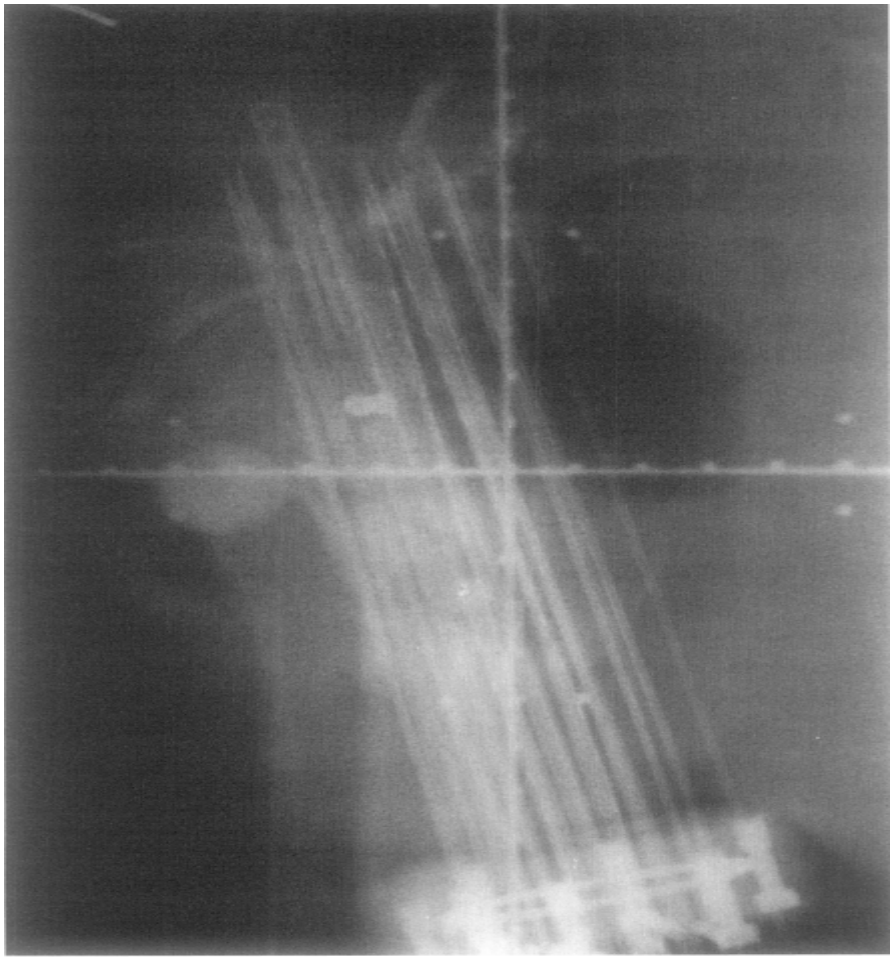
- 2D – Orthogonal X-rays

  → Lack of correlation of point doses to minimum dose delivered to target

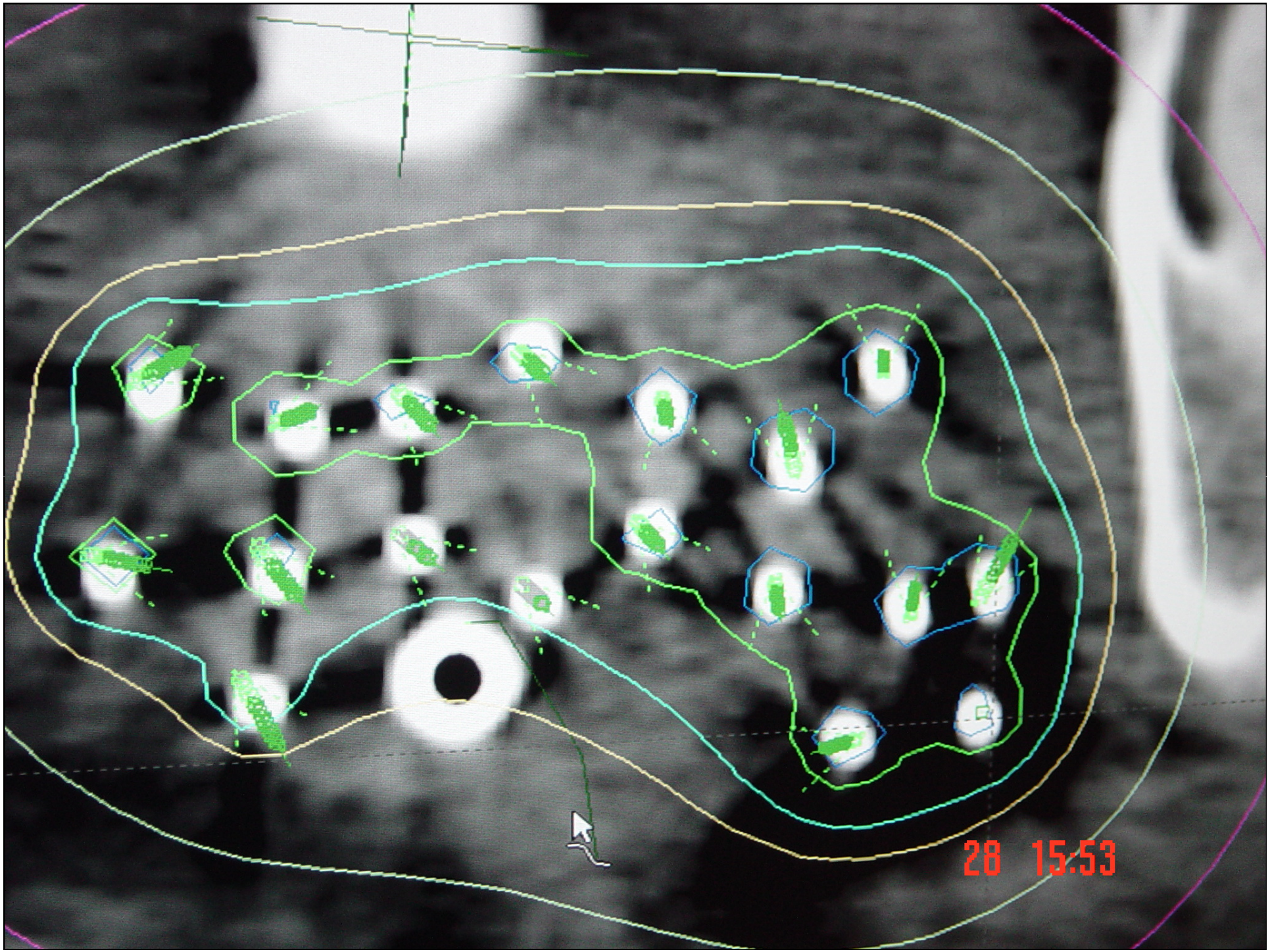
  → Lack of correlation of point doses to maximum dose delivered to OAR
- CT
- MRI

ORTHOGONAL RADIOGRAPHS





Overlap issues
No information about tumor volume / normal tissue anatomy
Inaccurate in determining which portion of organ is closest to implant


28 15:53

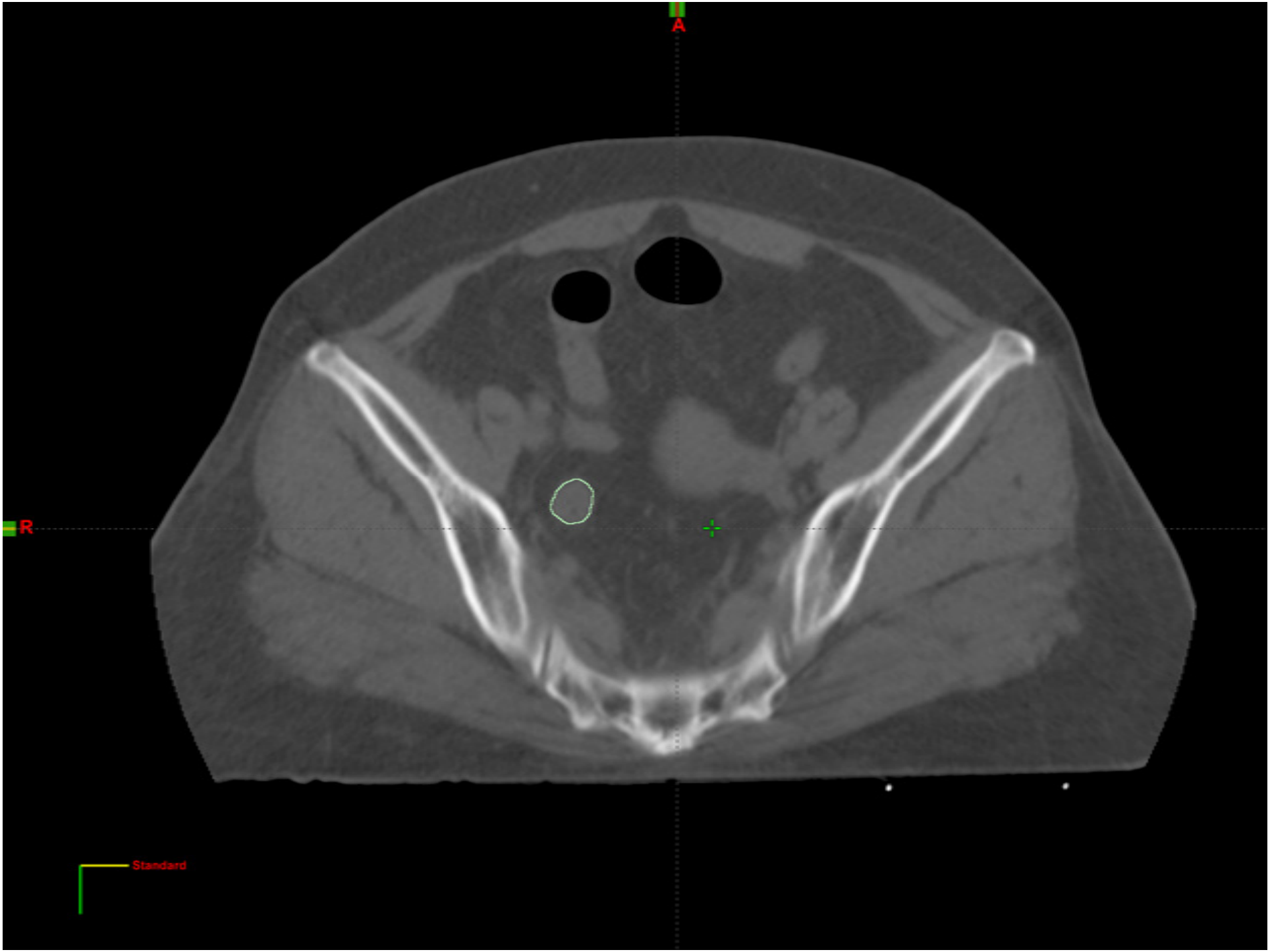
NOW

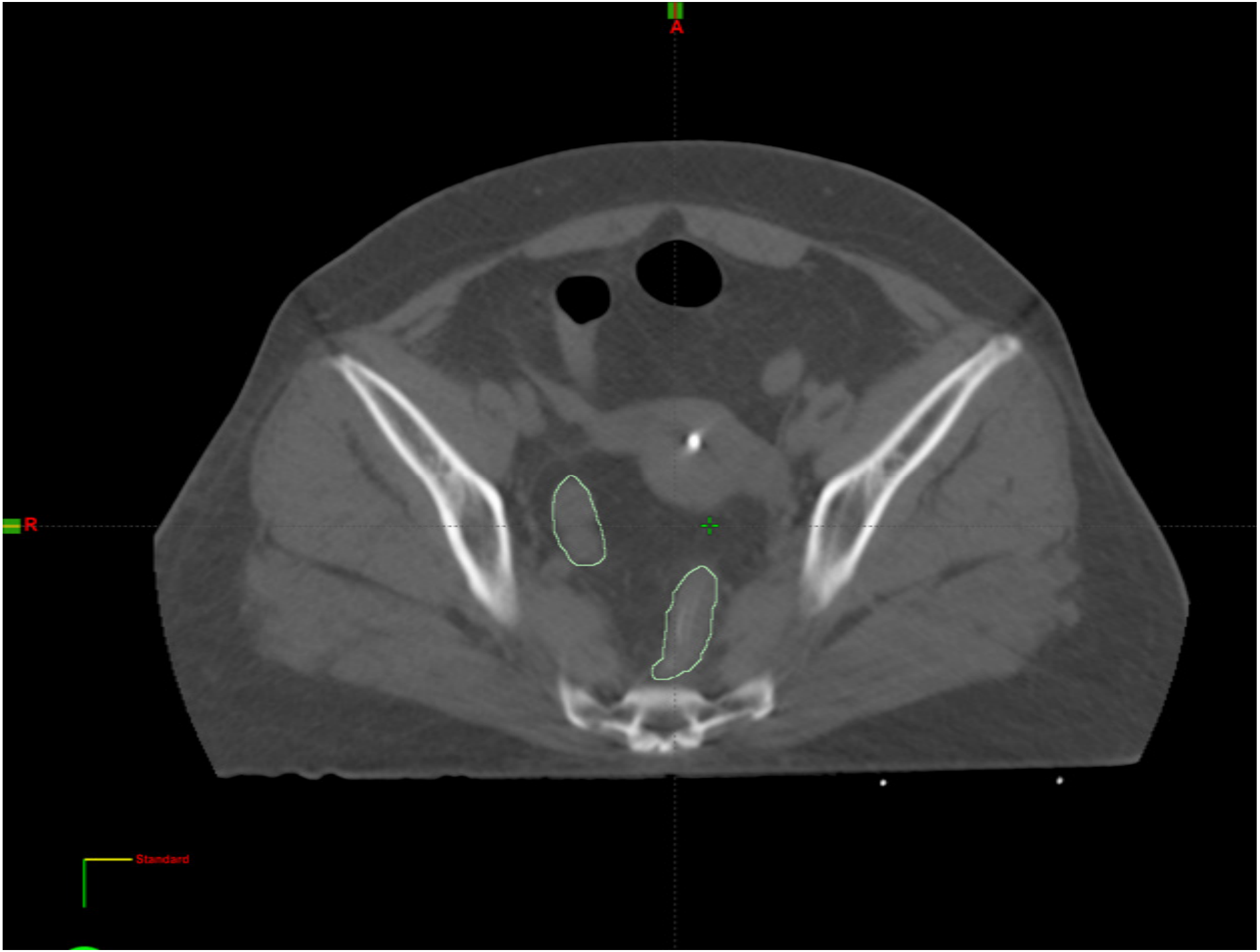
- 50 ml of dilute contrast (5ml in 100 ml saline) in bladder
- 2o ml of same contrast in rectum and sigmoid

- DELINEATION – Using GEC-ESTRO MRI definitions
  GTV– not delineated
  CTV --
  → 1st session – Original disease extent – IRCTV
  6.5 Gy x 2
  → 2ndsession – Present disease extent -- HRCTV –
  6.5Gy X 4

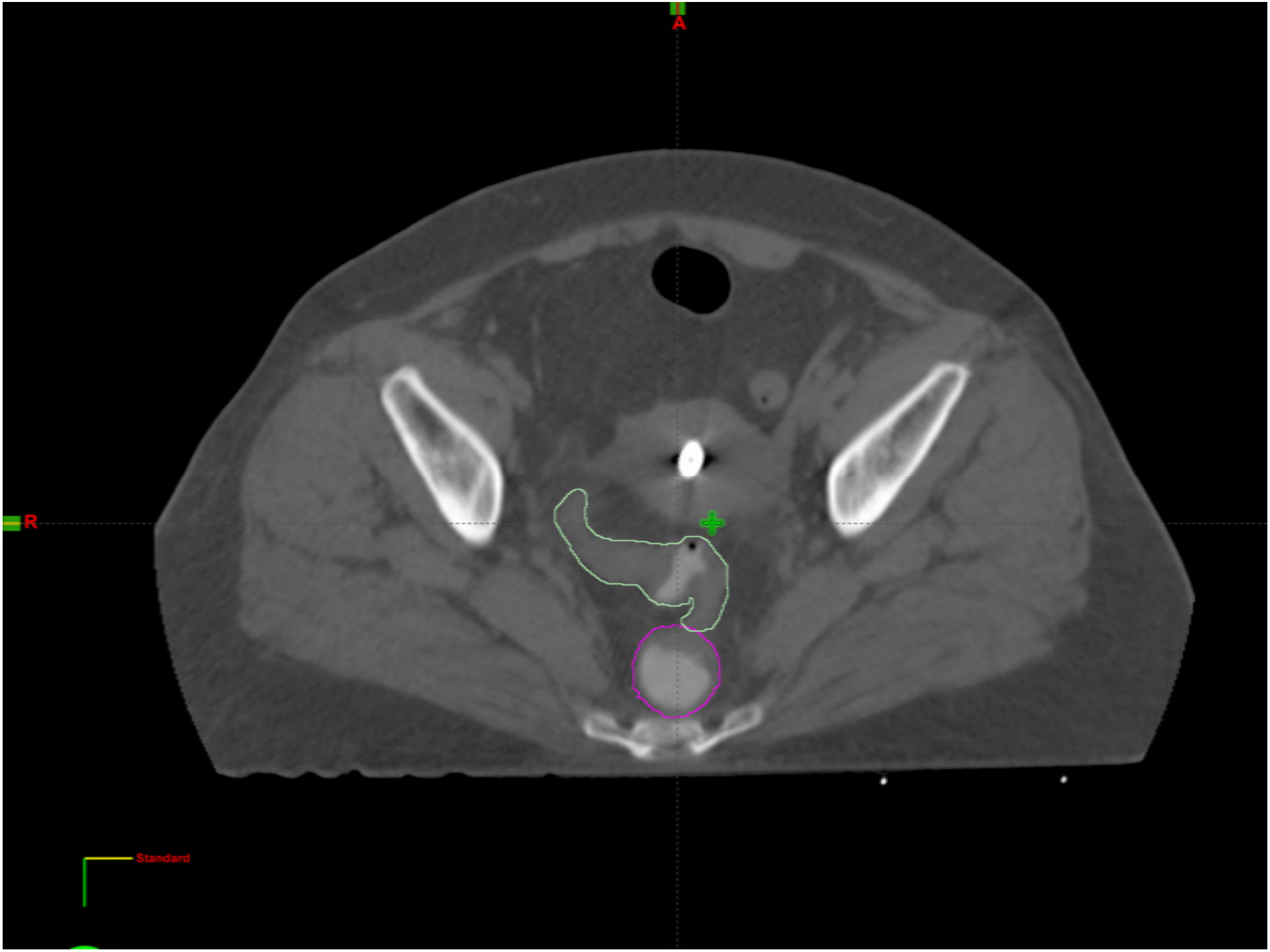
- OAR – Rectum, sigmoid, bladder

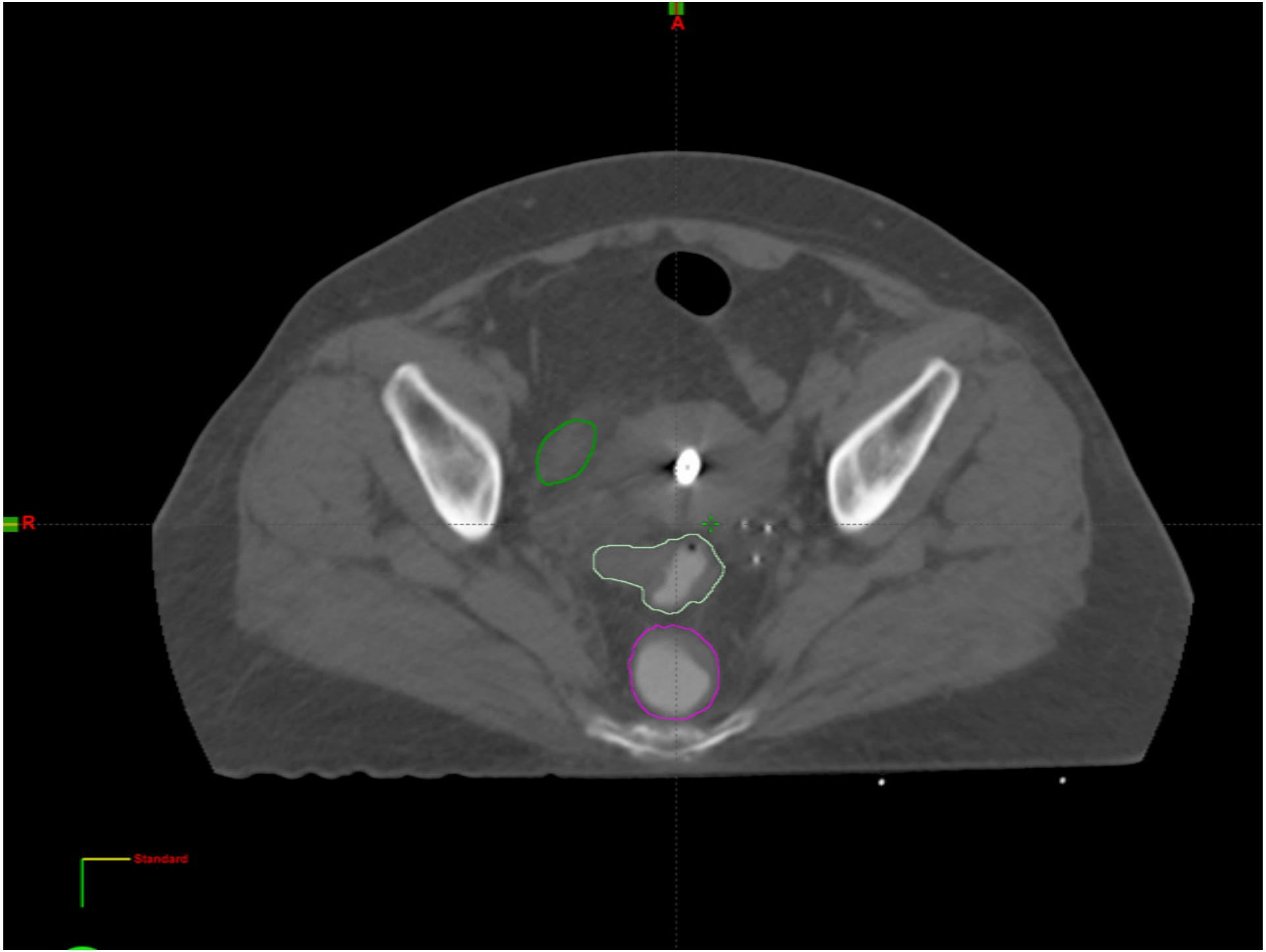
- Plan evaluation –
  CTV -- D90, V1OO, V150
  Rectum, bladder, sigmoid – D.1, D1, D2

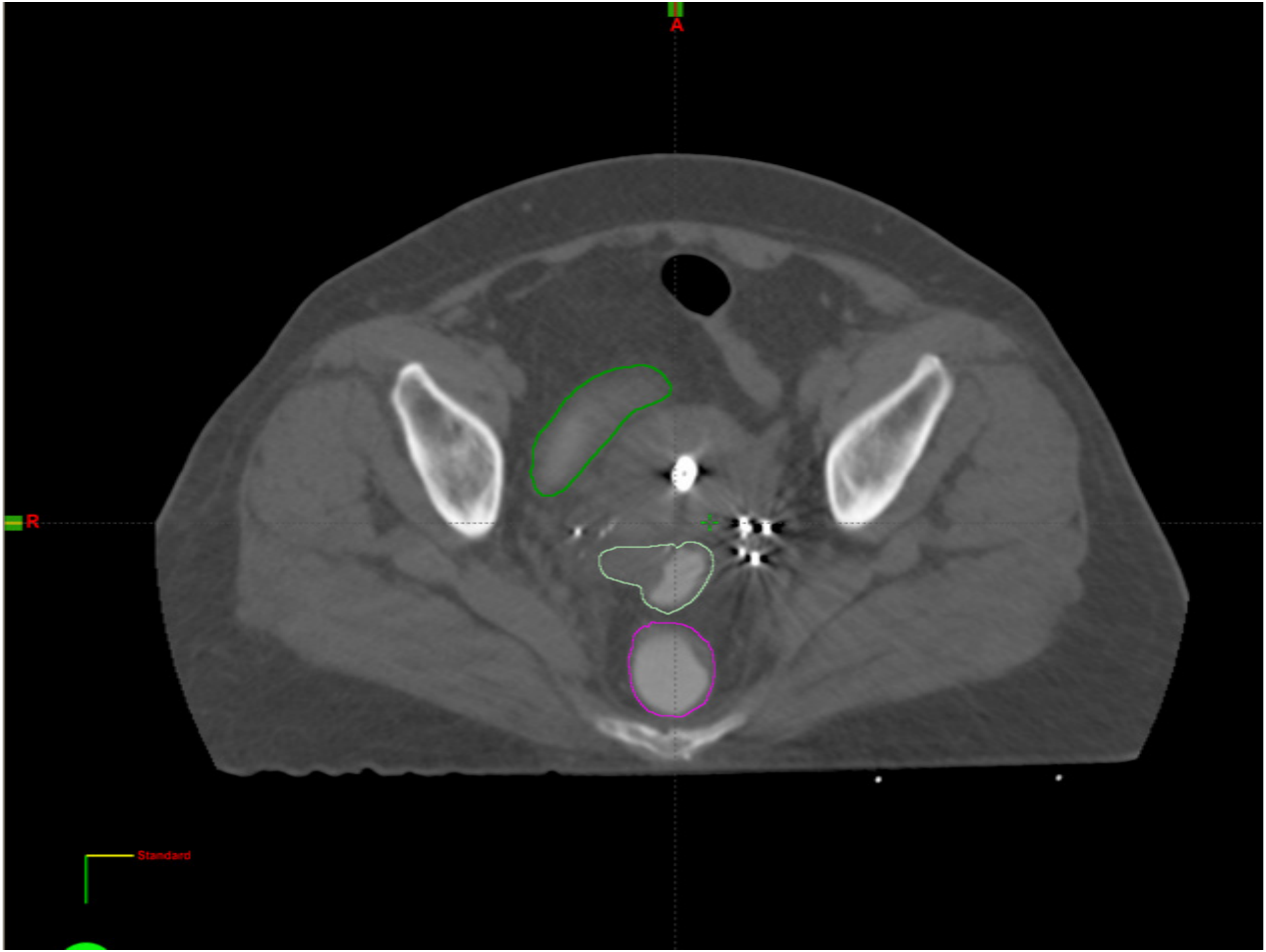

A
R
Standard

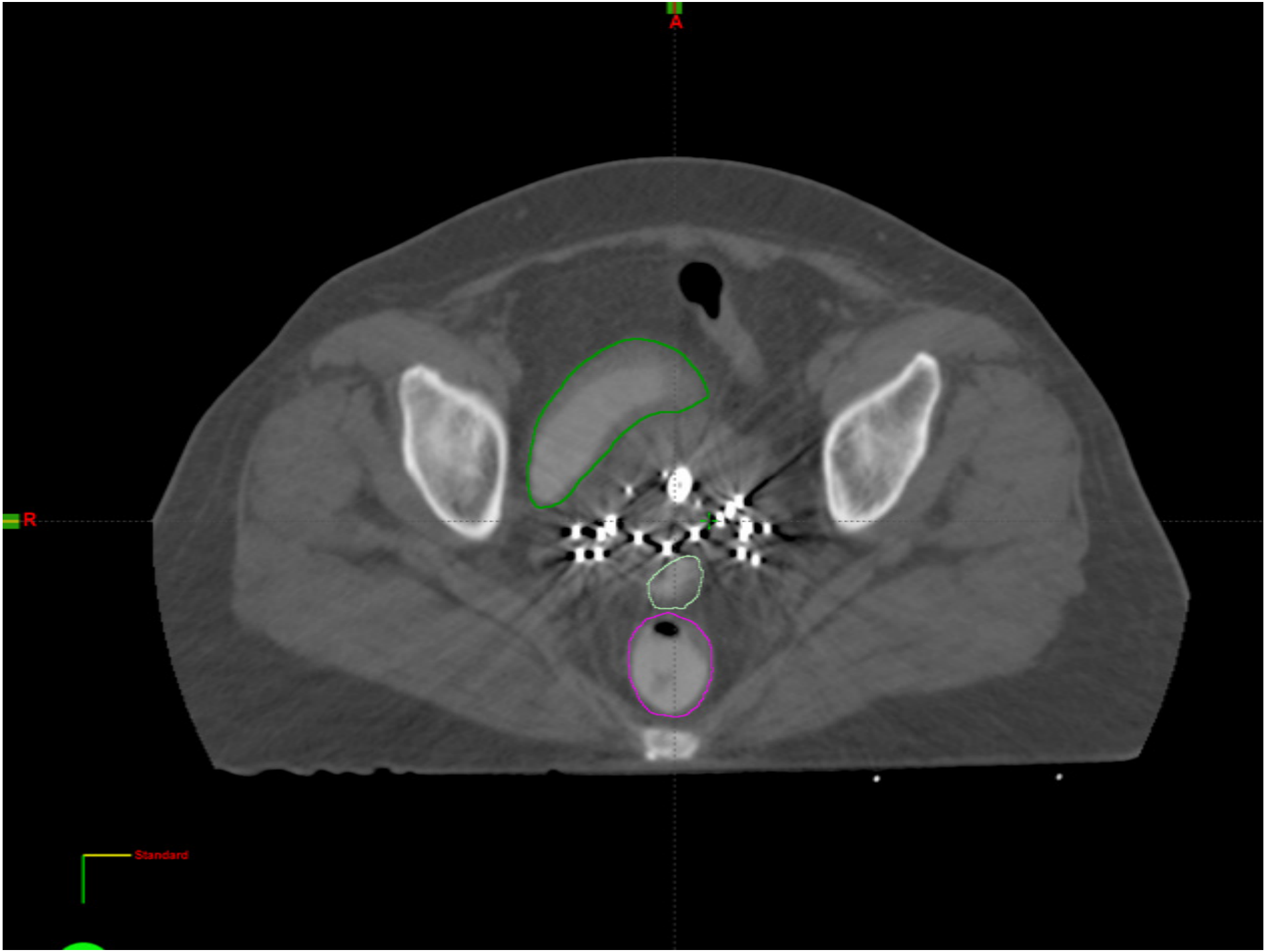

A
R
Standard

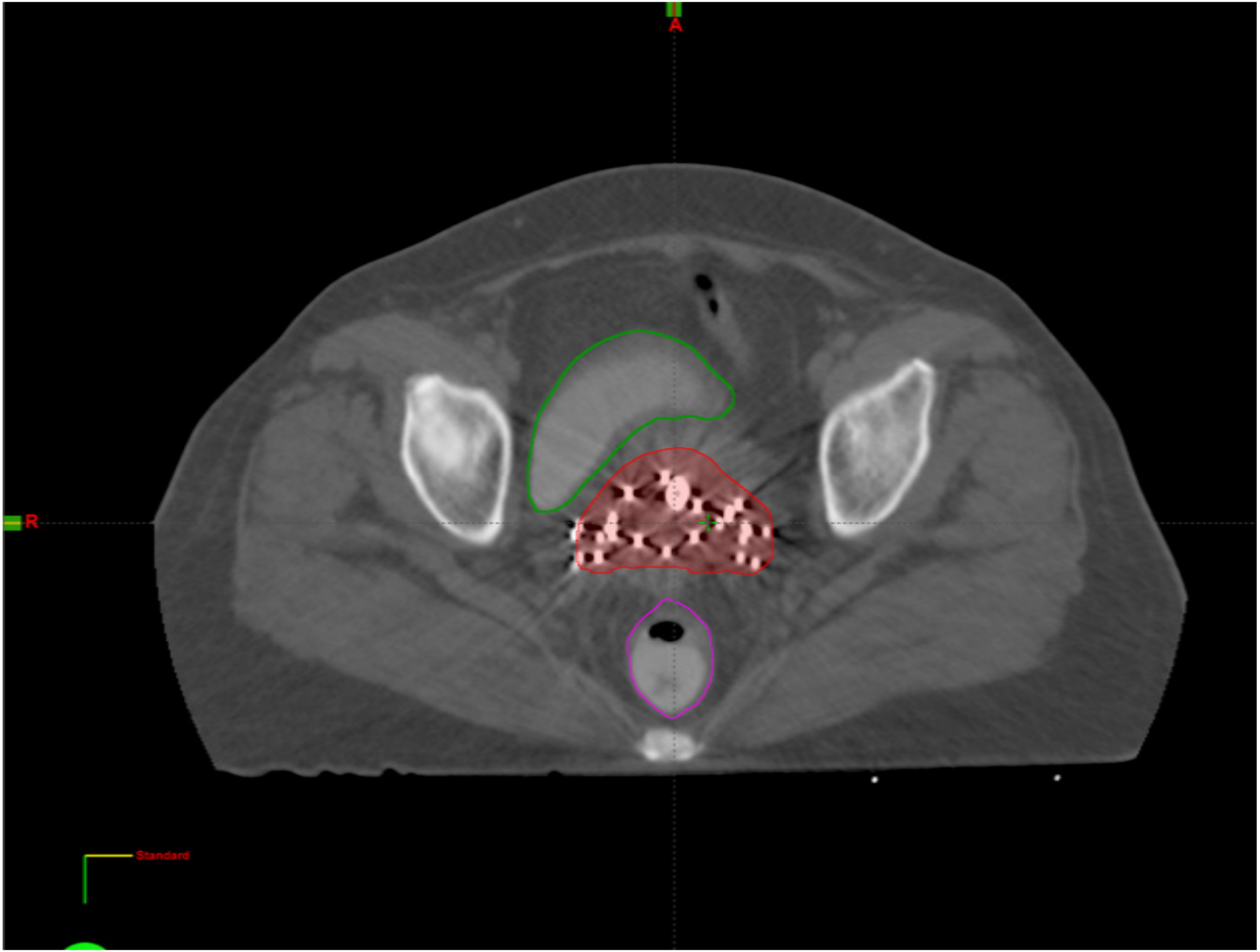

A
R
Standard

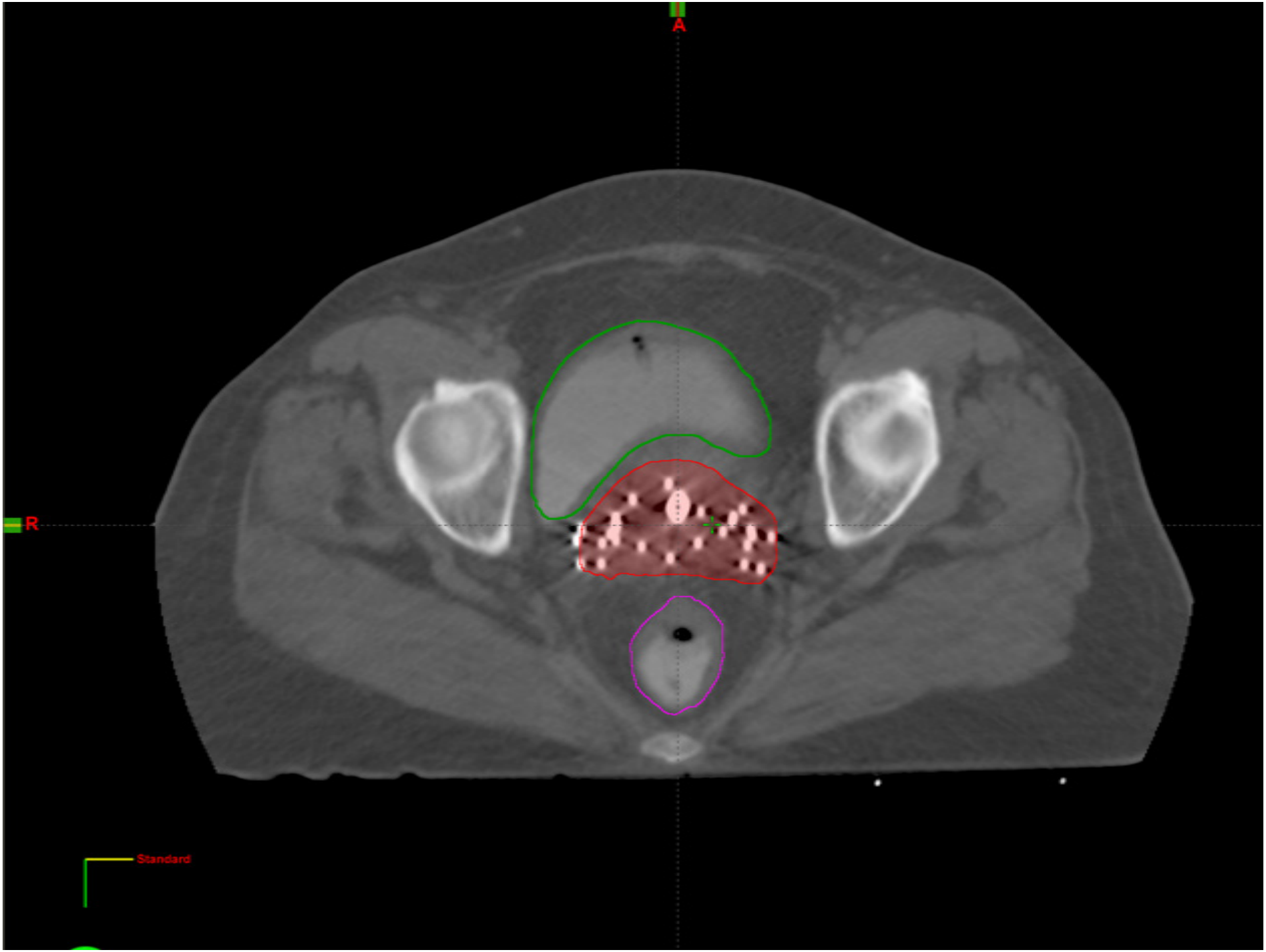

A
R
Standard

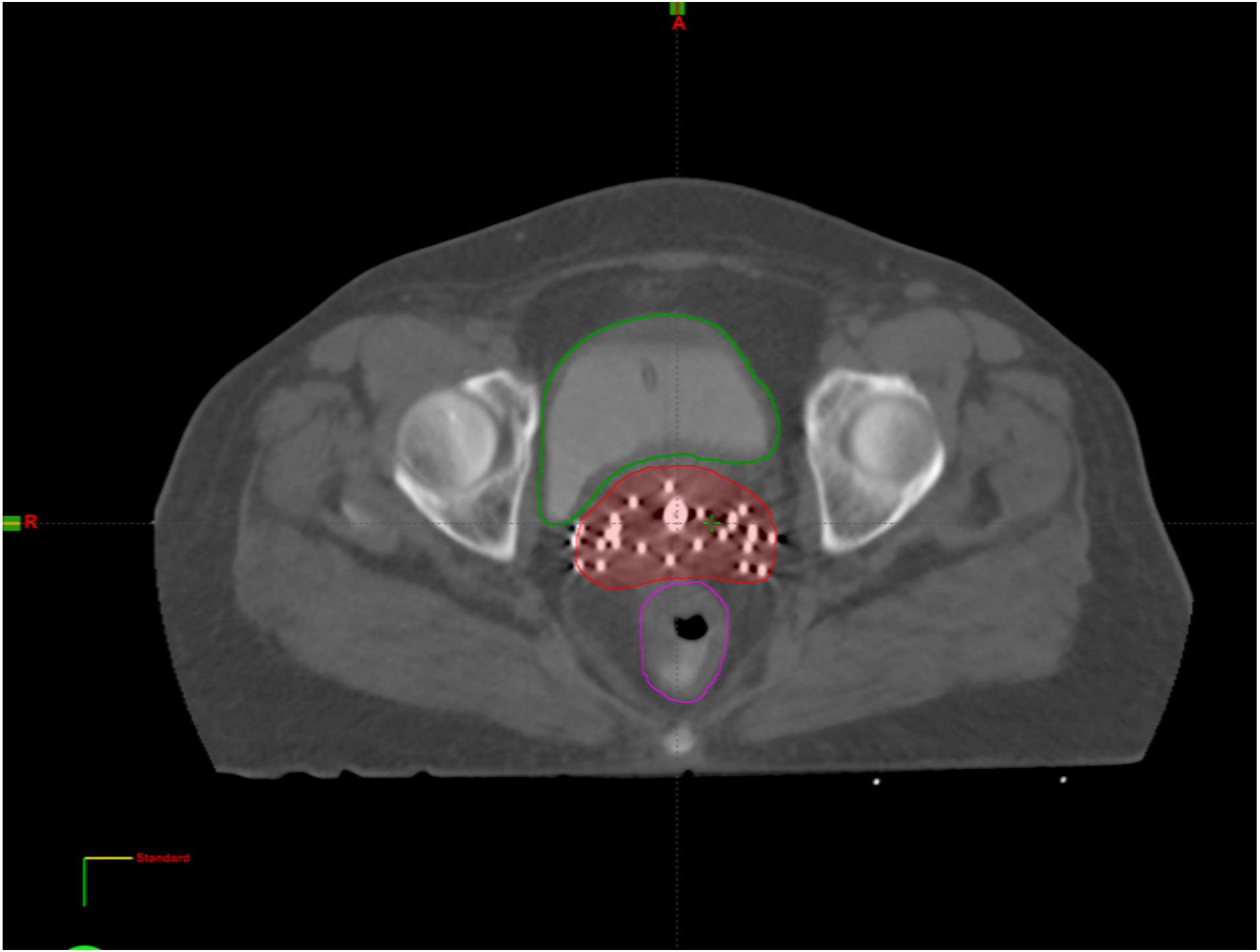

A
R
Standard

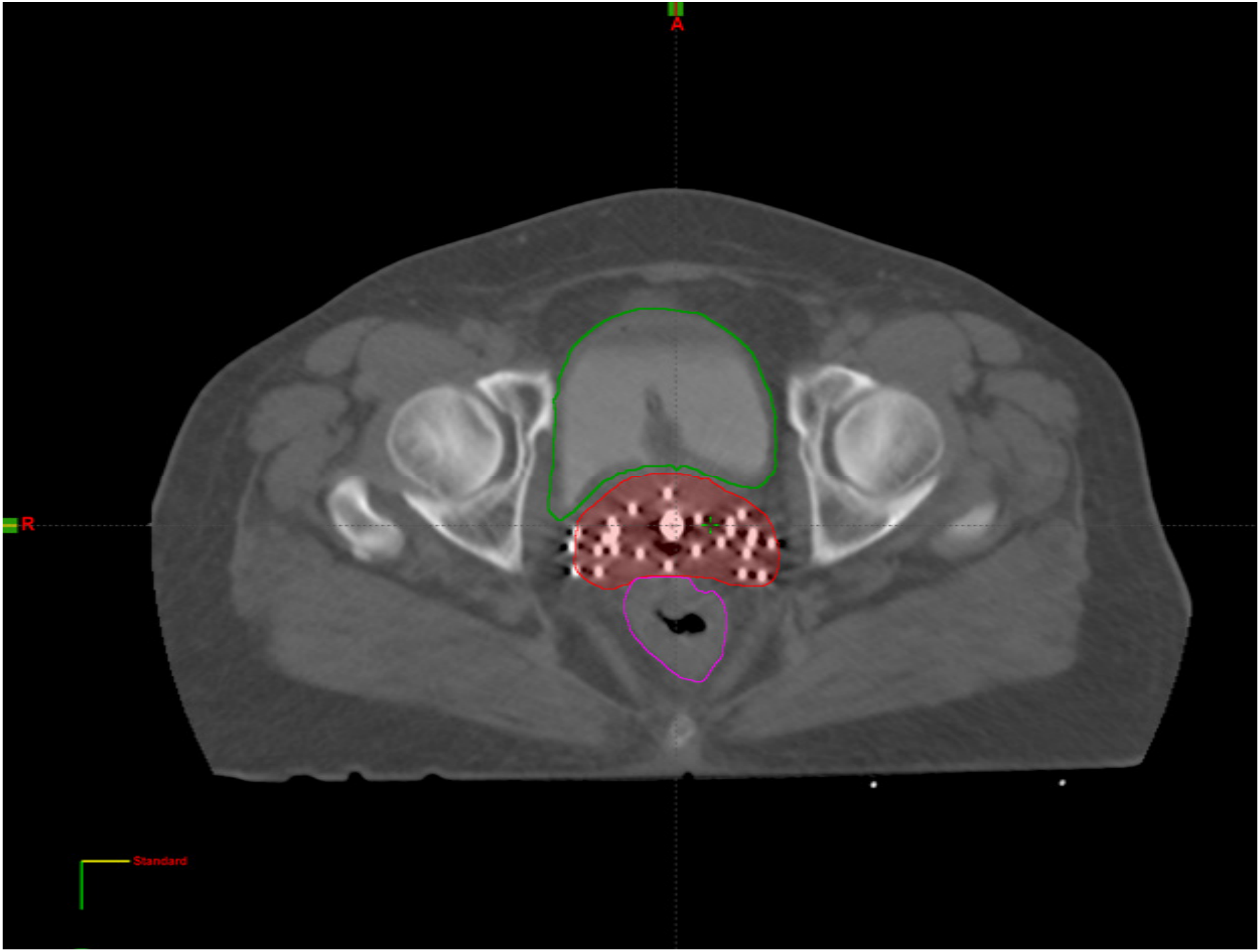

A
R
Standard

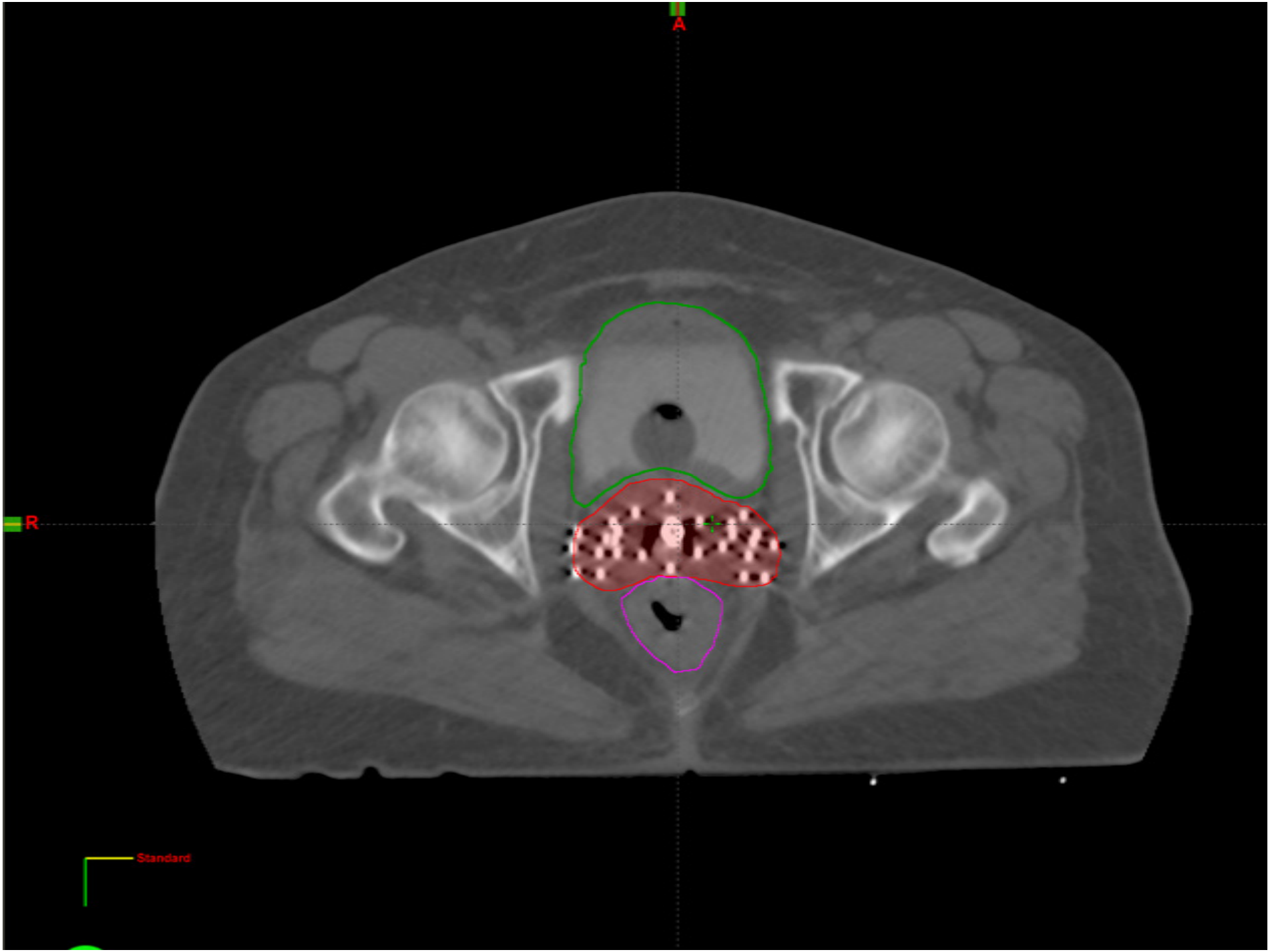

A
R
Standard


A
R
Standard

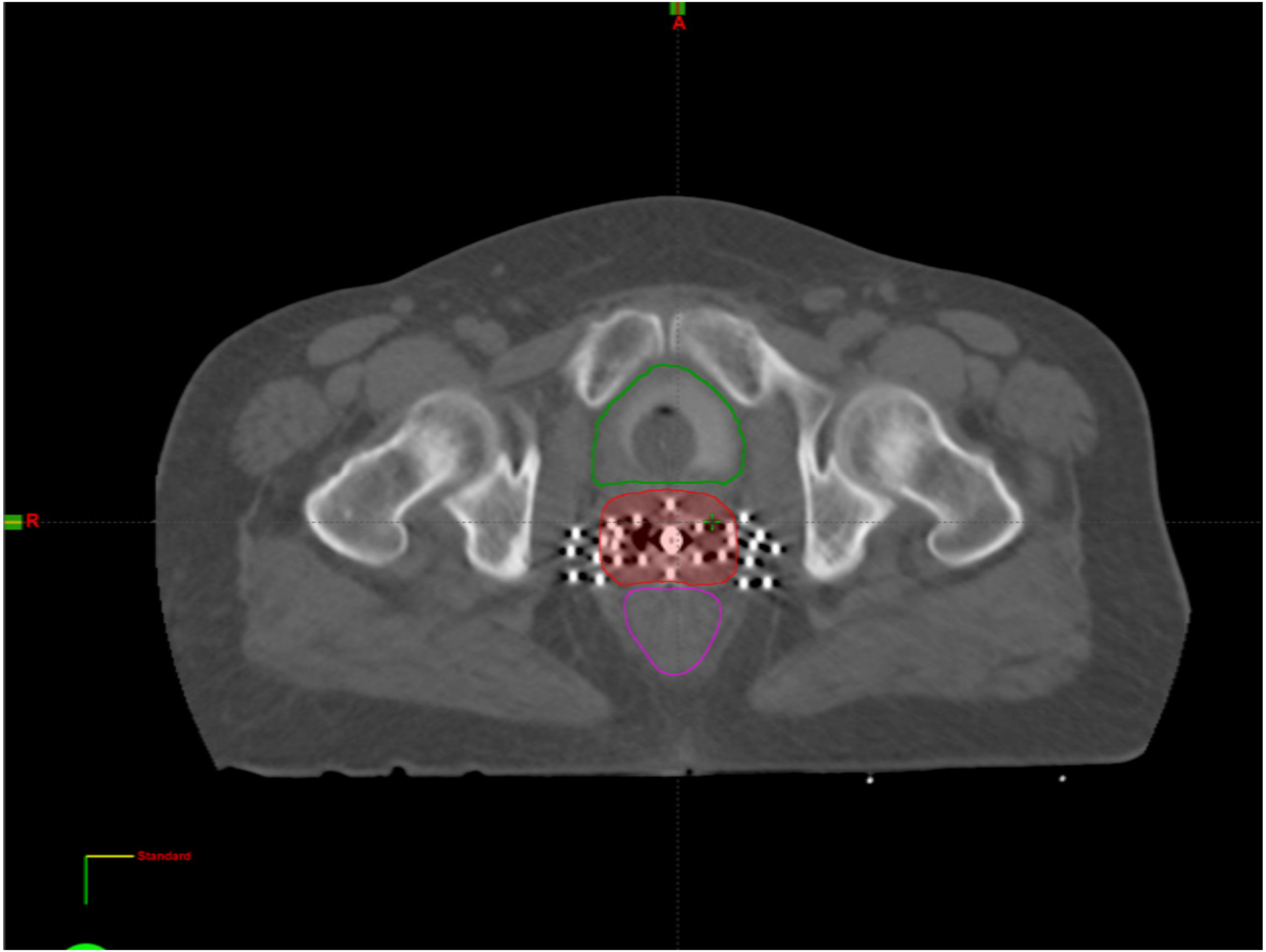

A
R
Standard

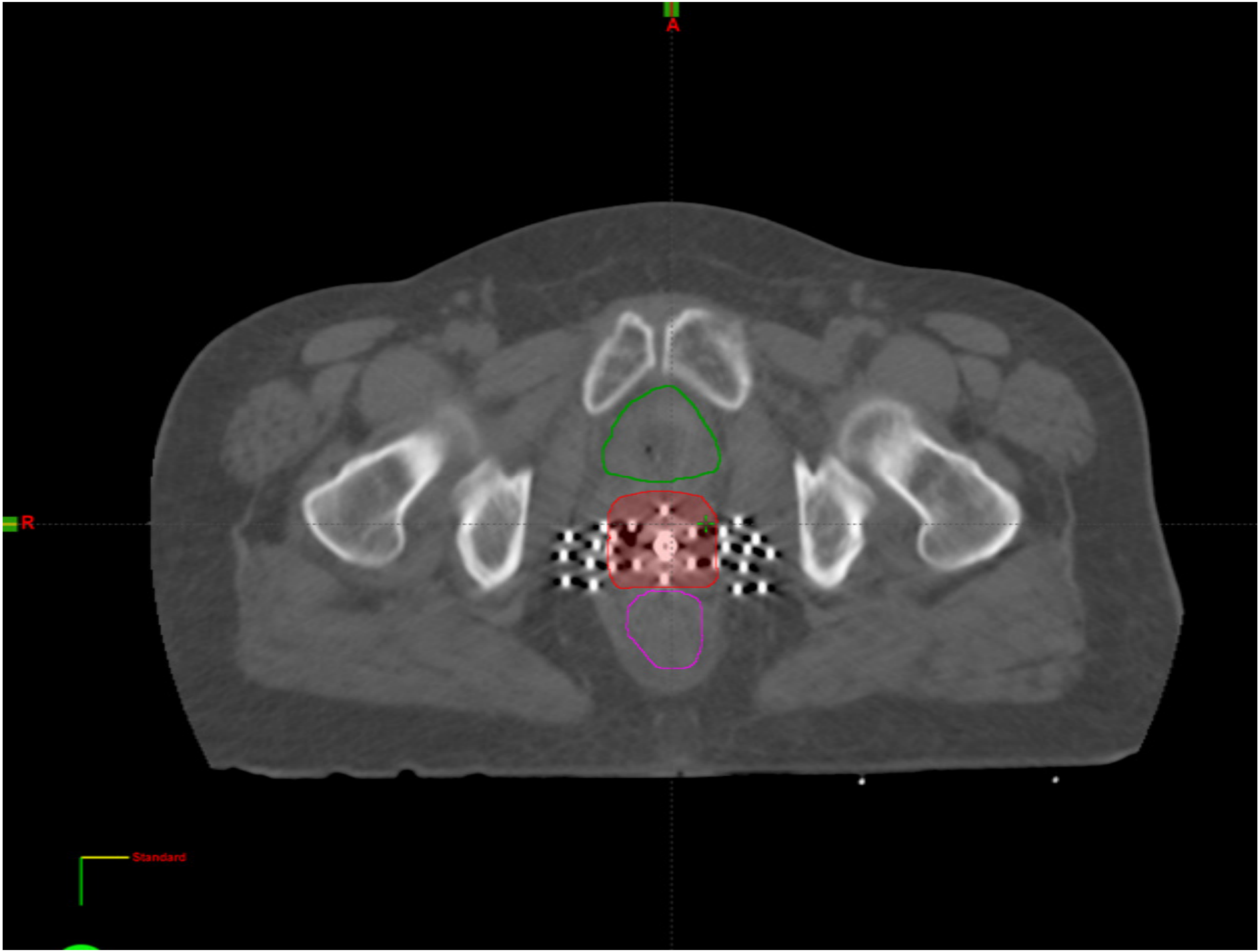

A
R
Standard

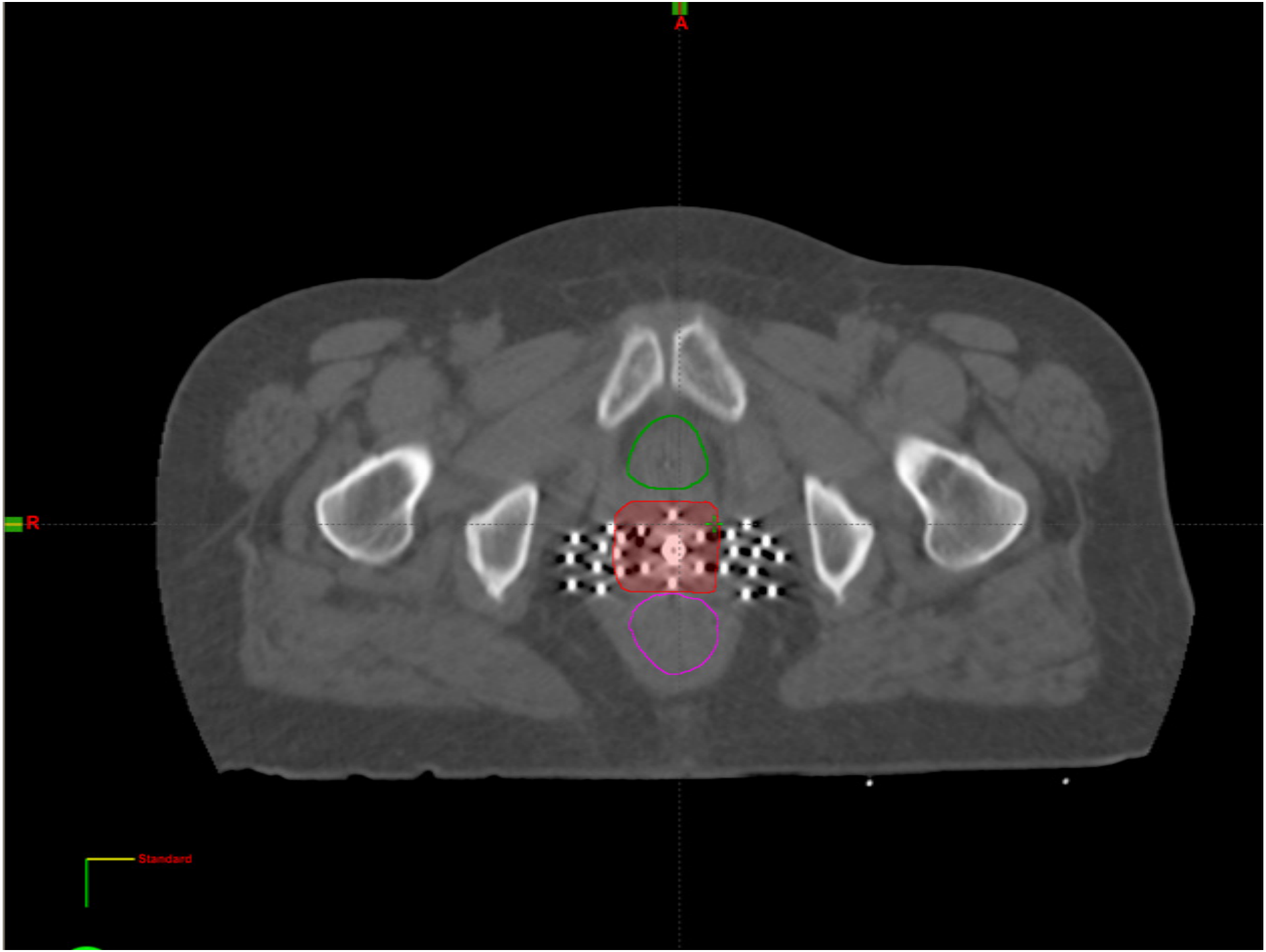

A
R
Standard

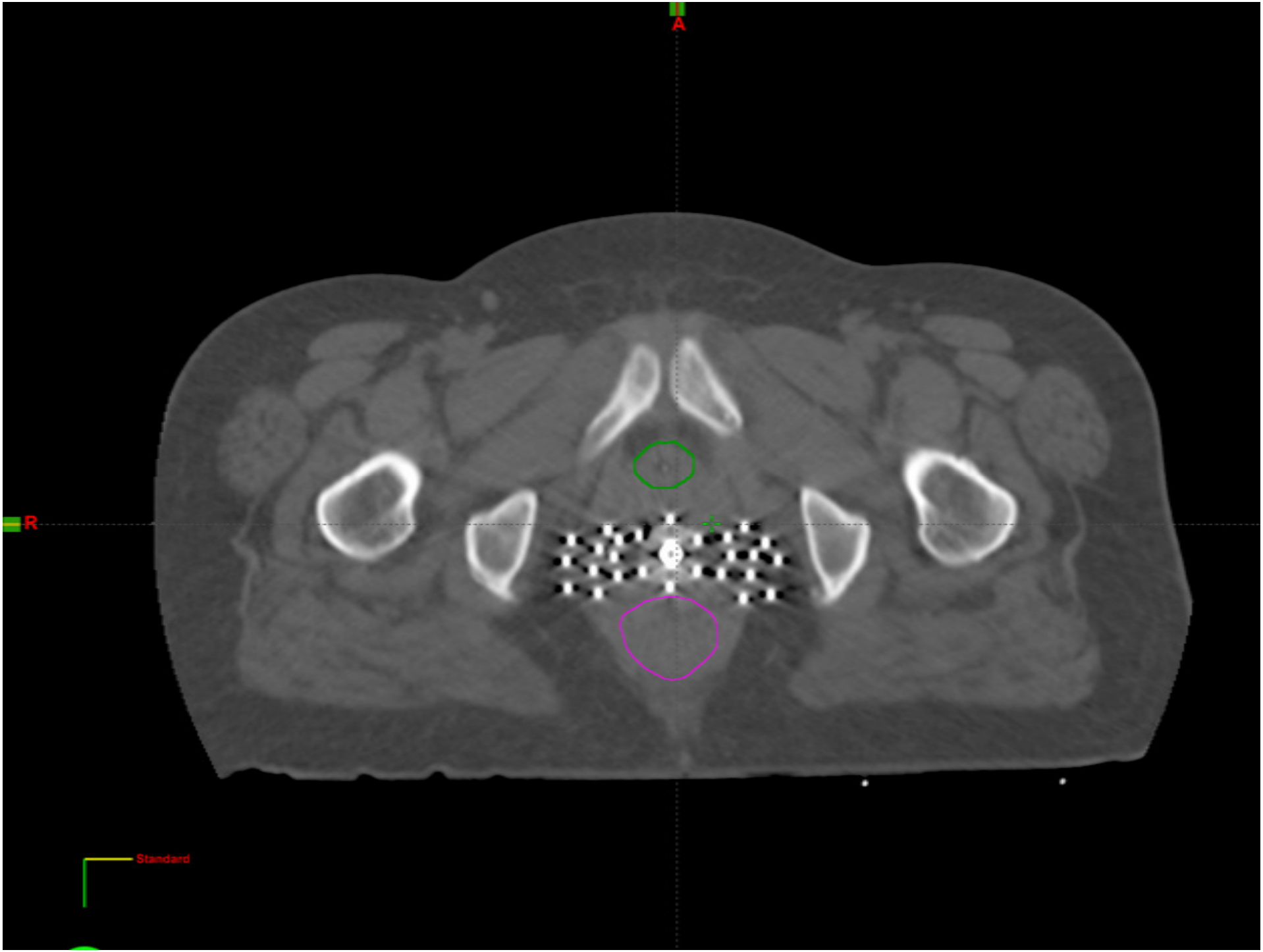

A
R
Standard

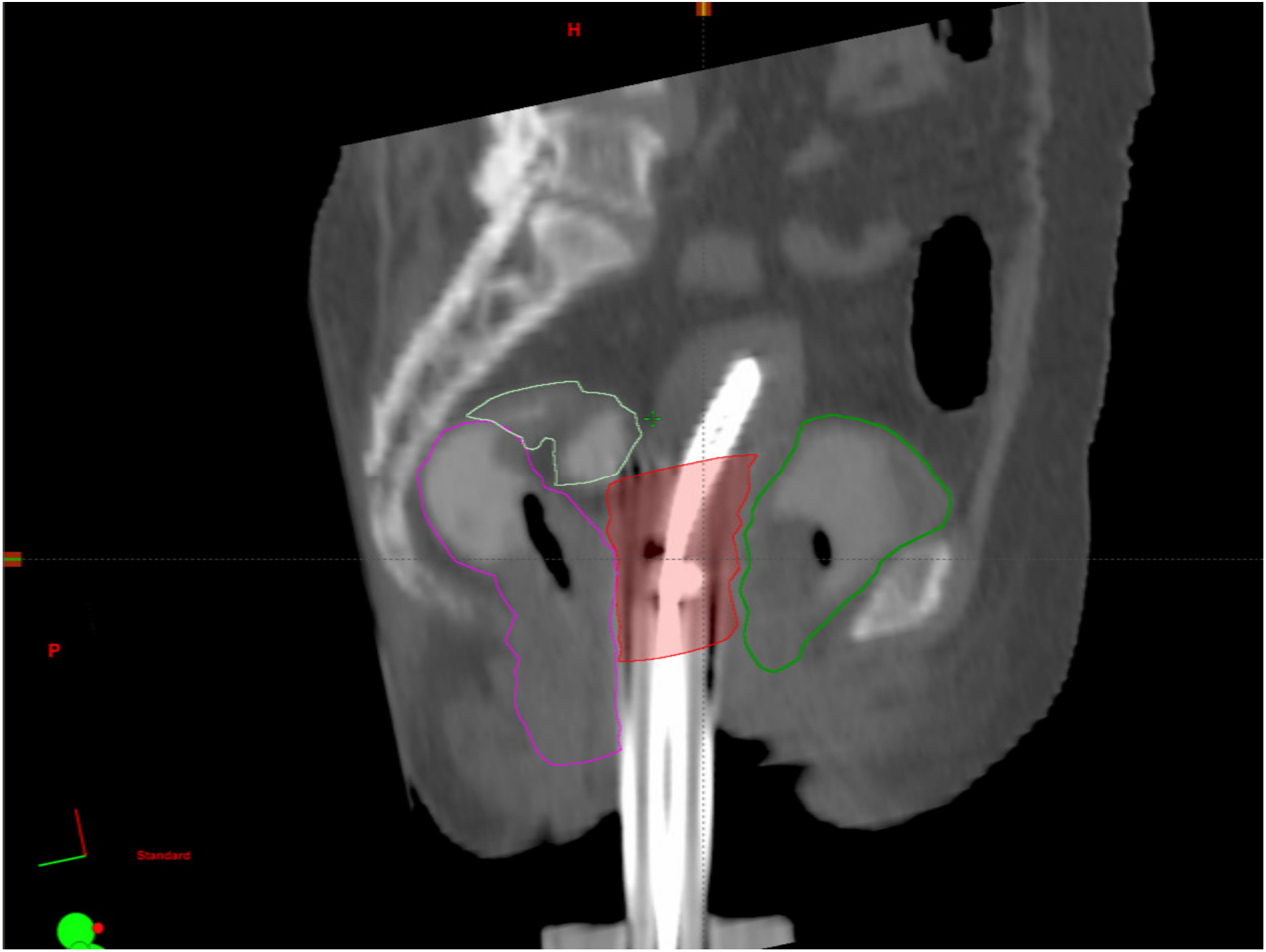

A
R
Standard

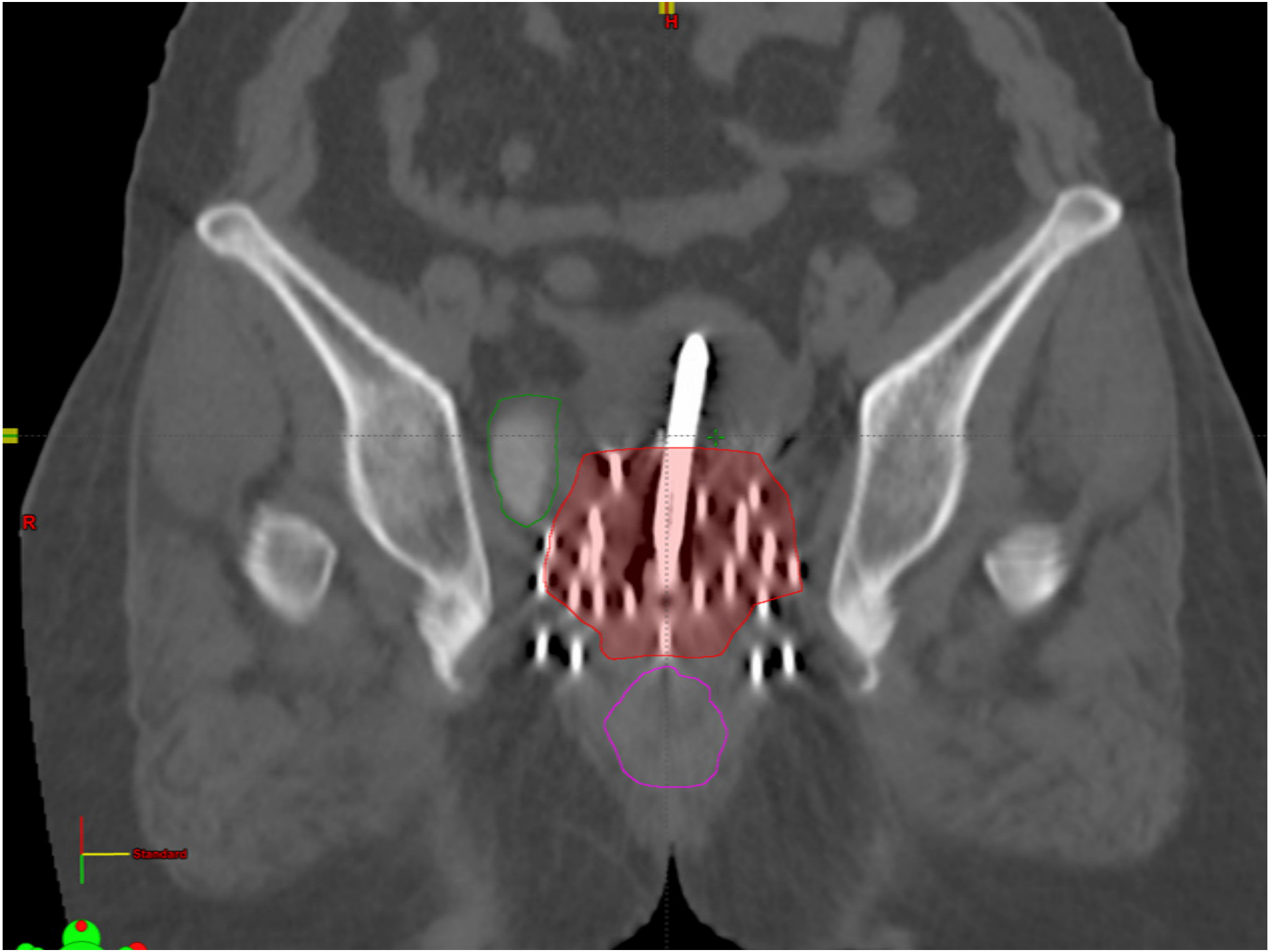

A
R
Standard

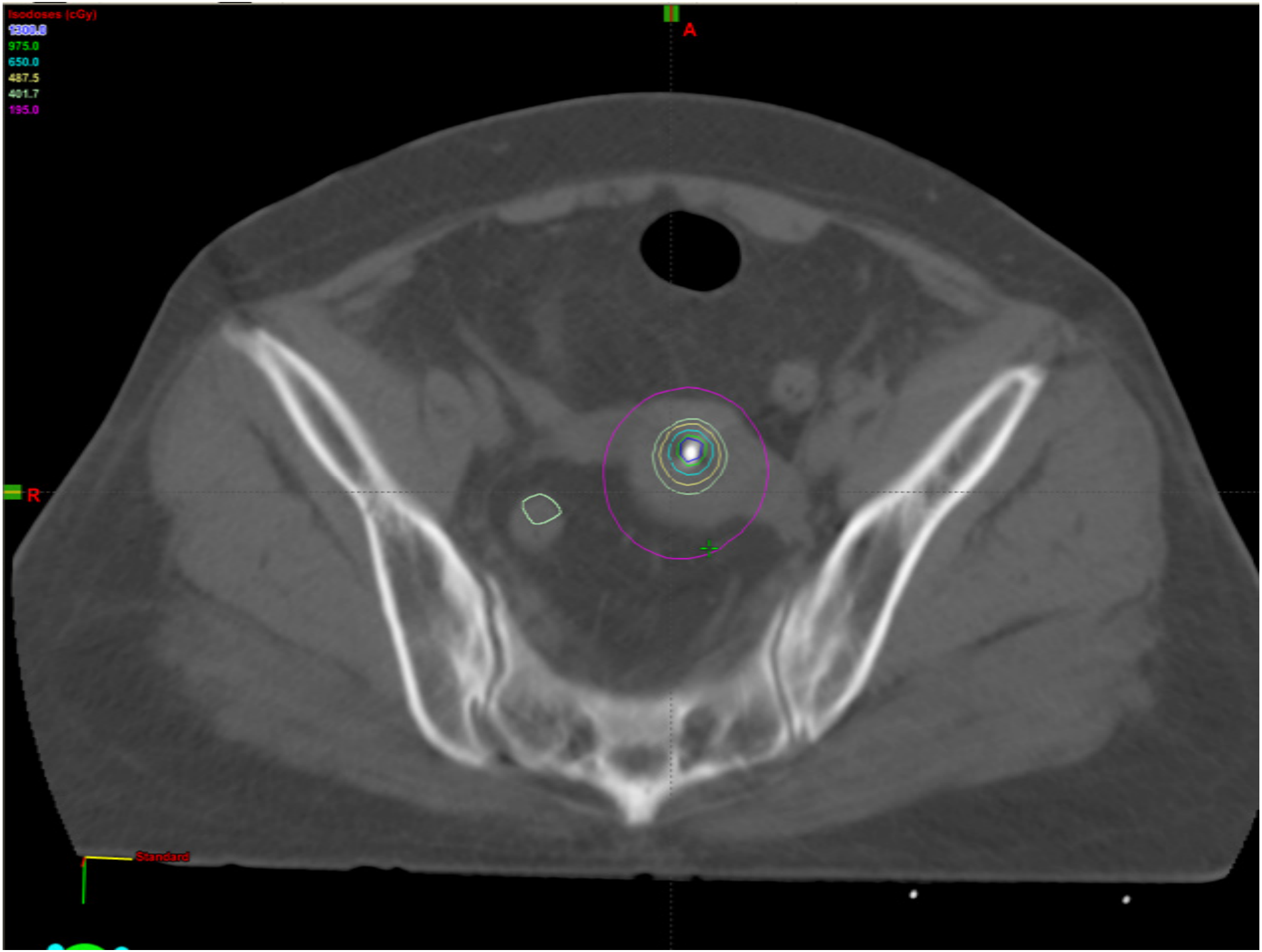

A
R
Standard

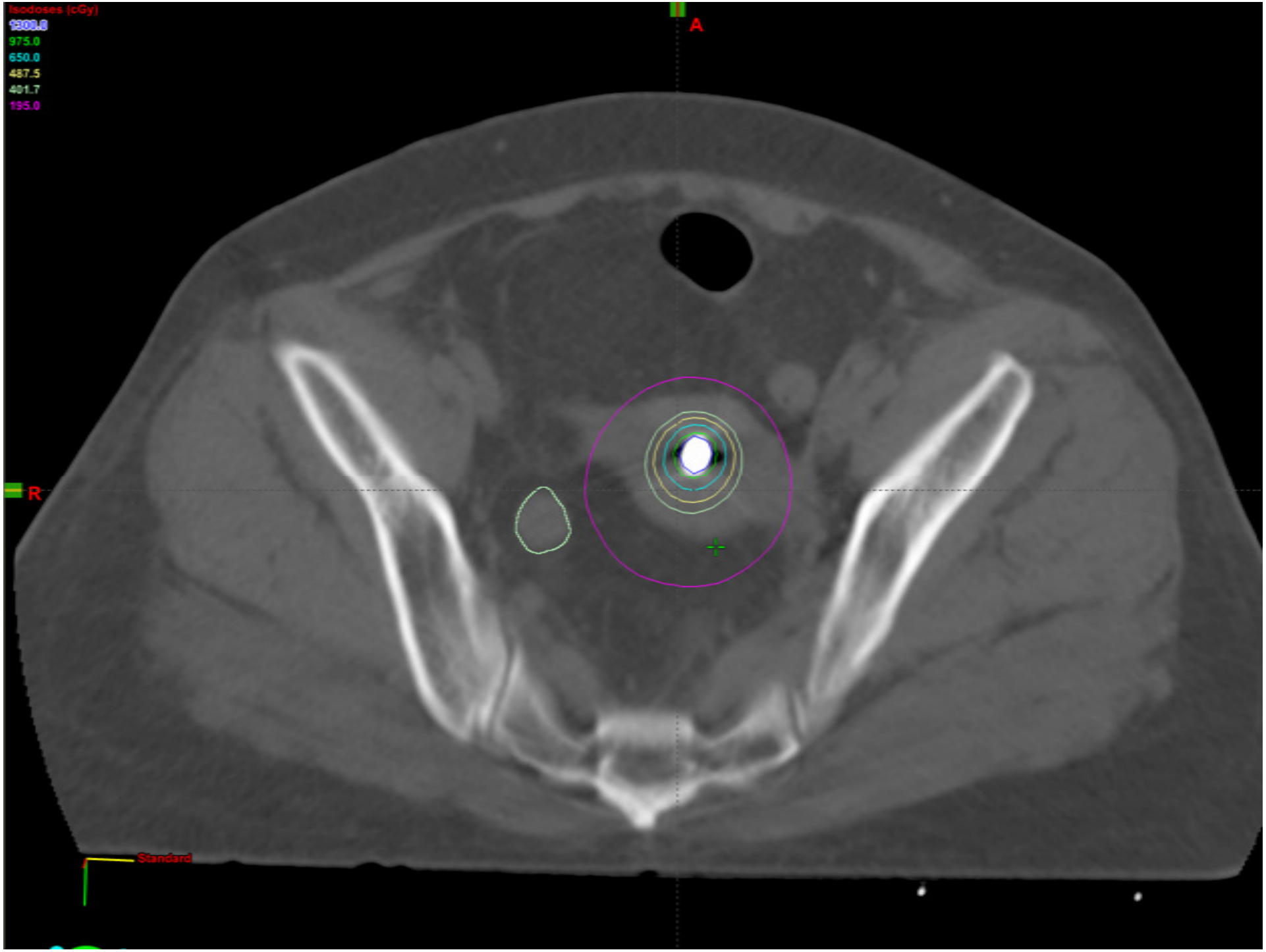

A
R
Standard

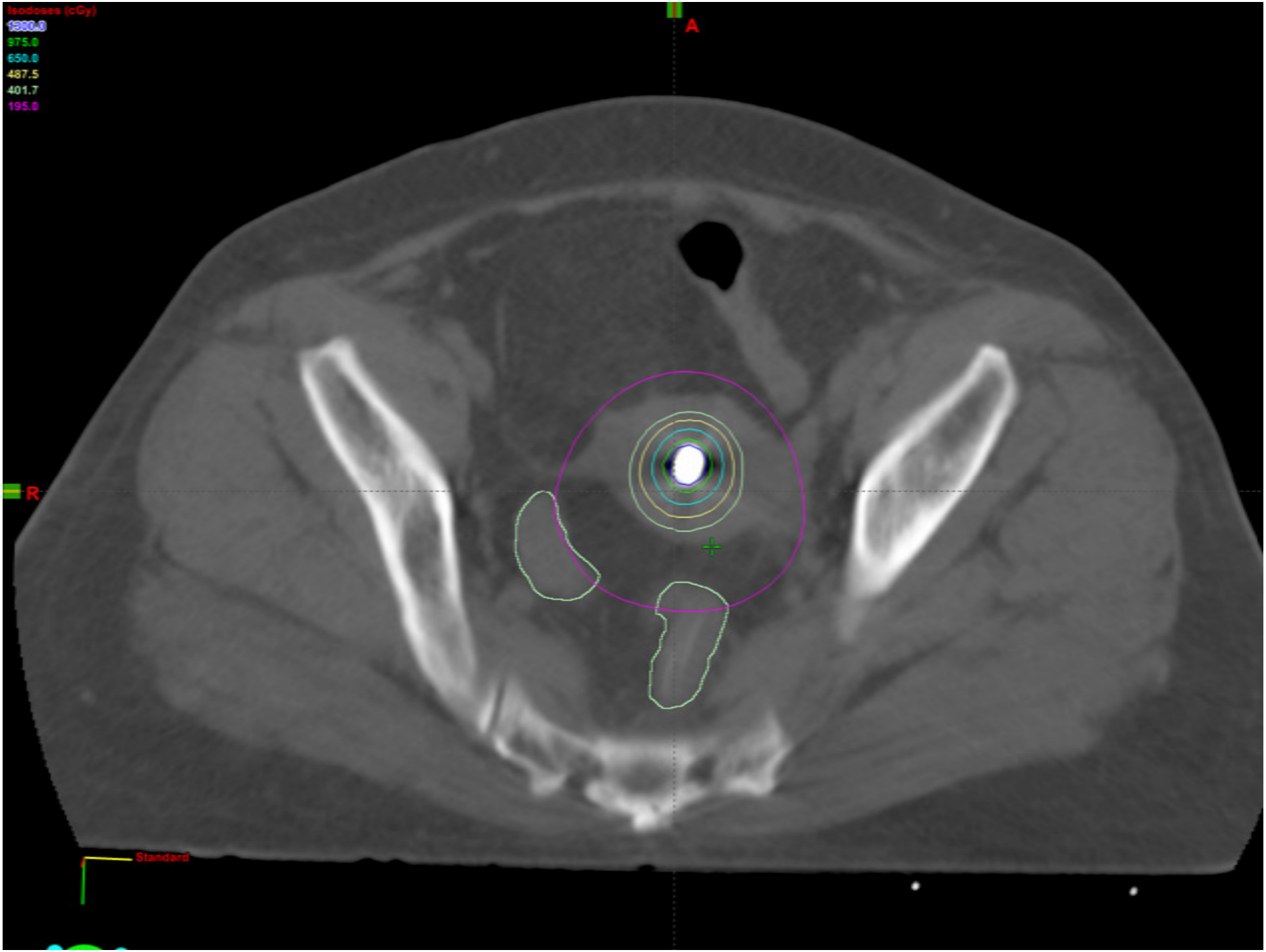

A
R
Standard

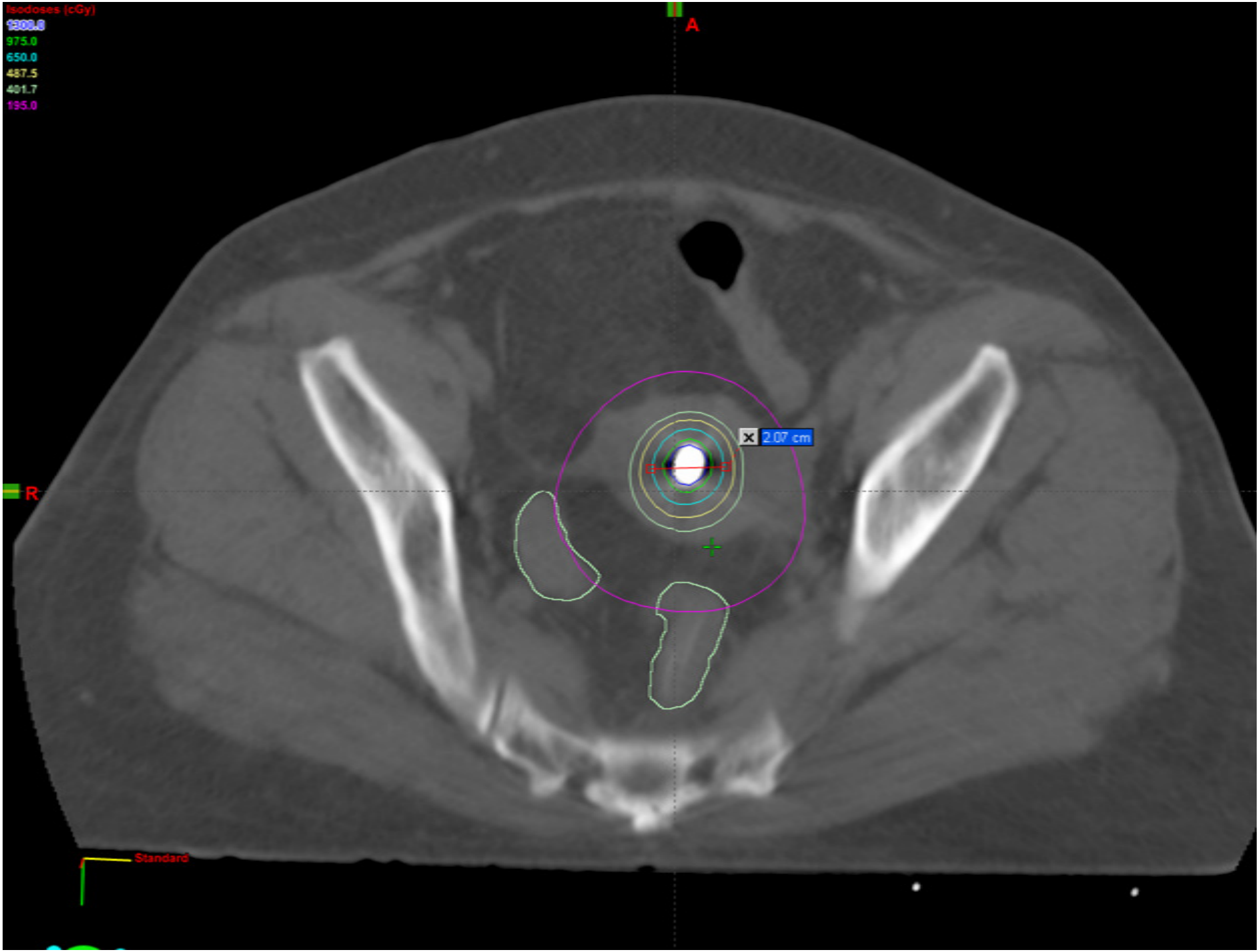

H
P
Standard

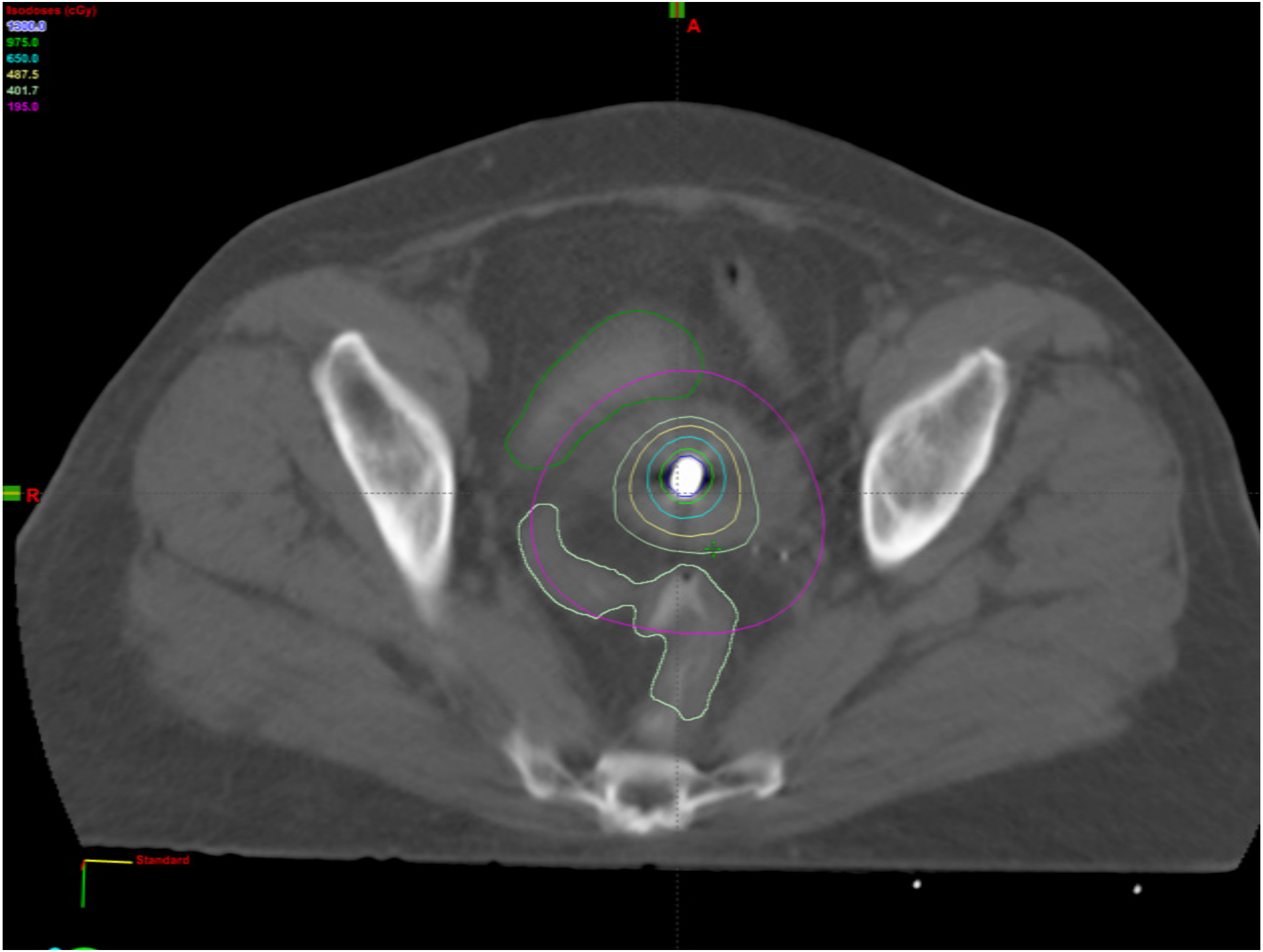

H
R
Standard

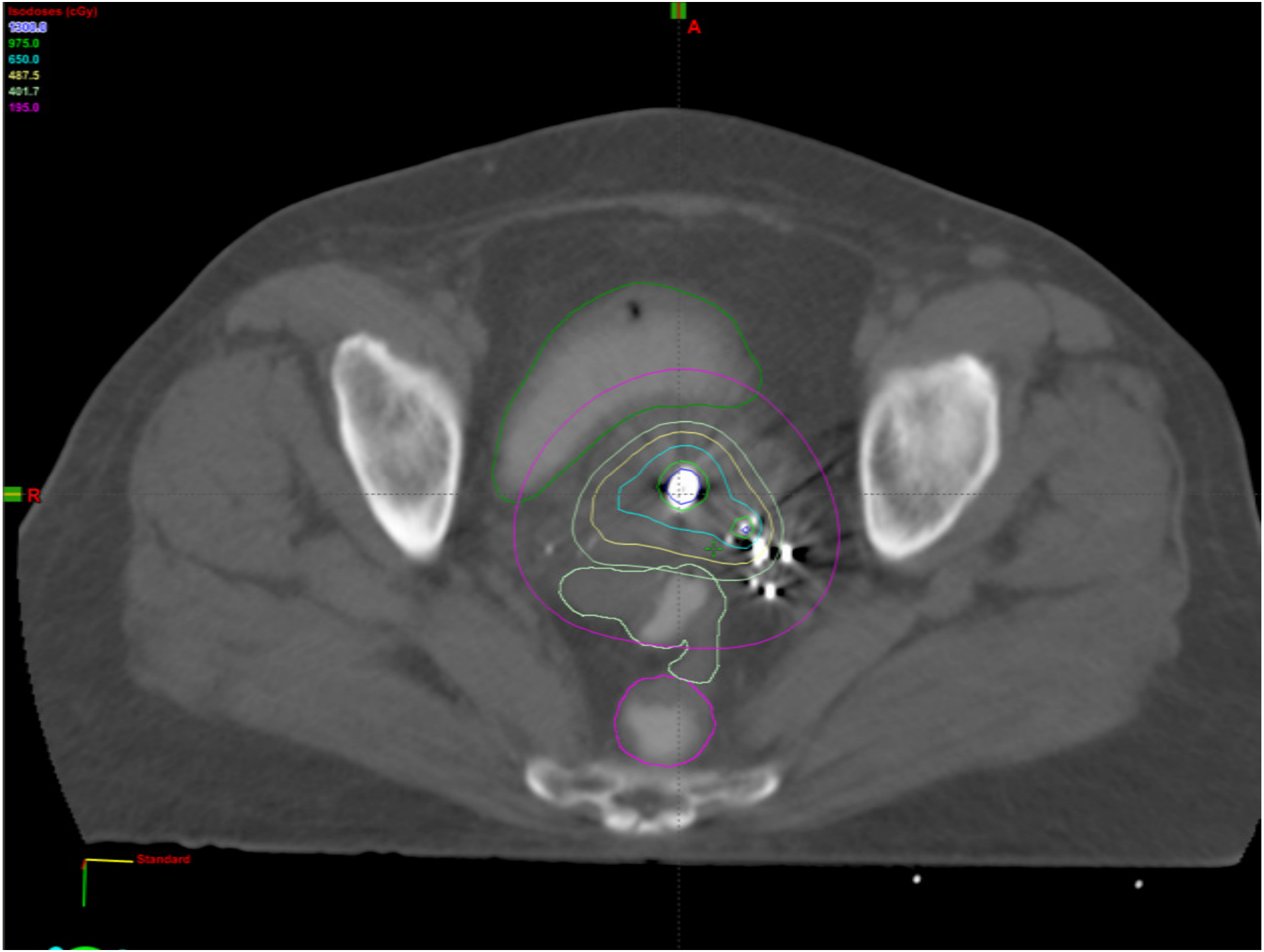

Isodoses (cGy)
1301.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

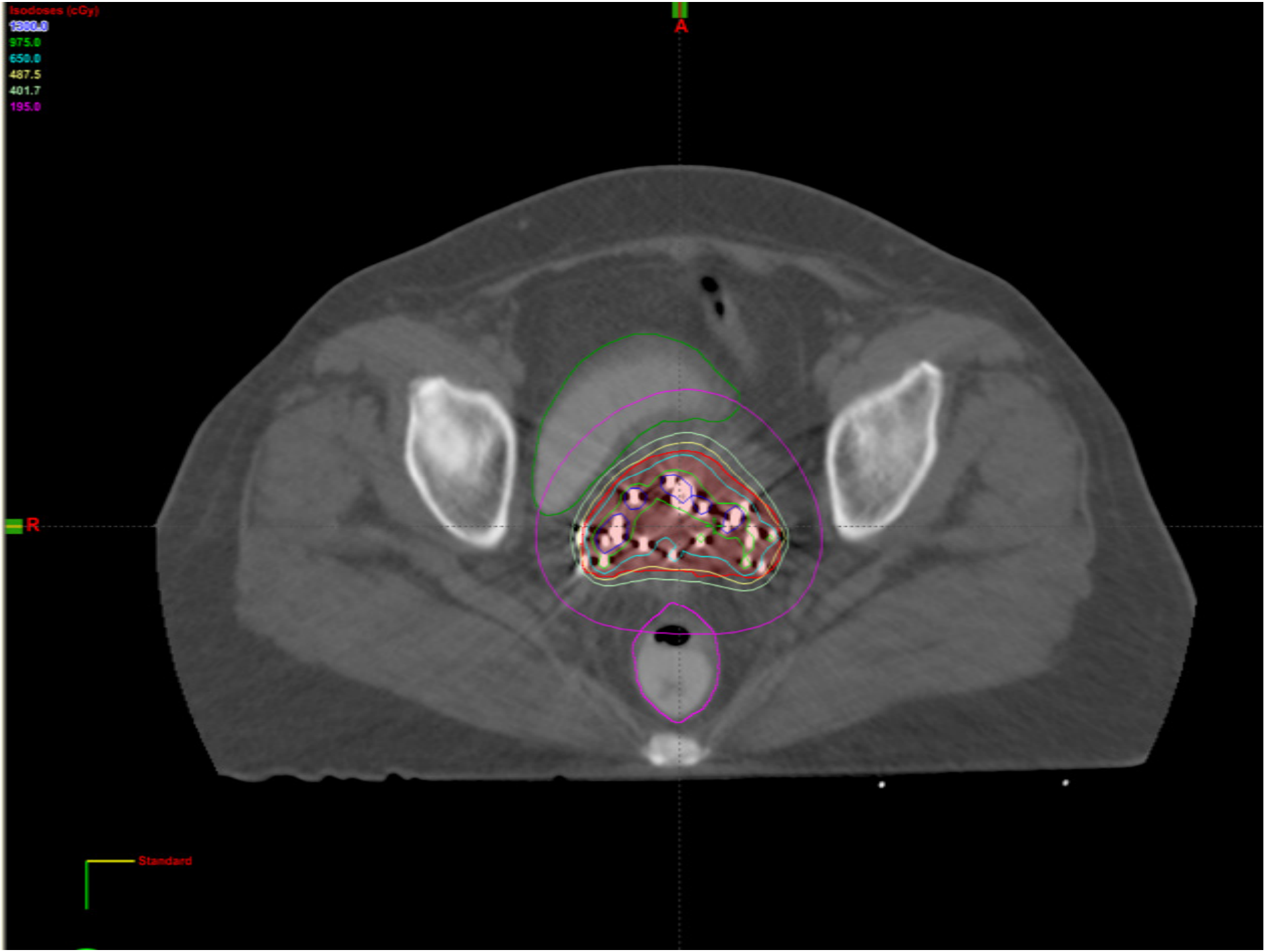

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

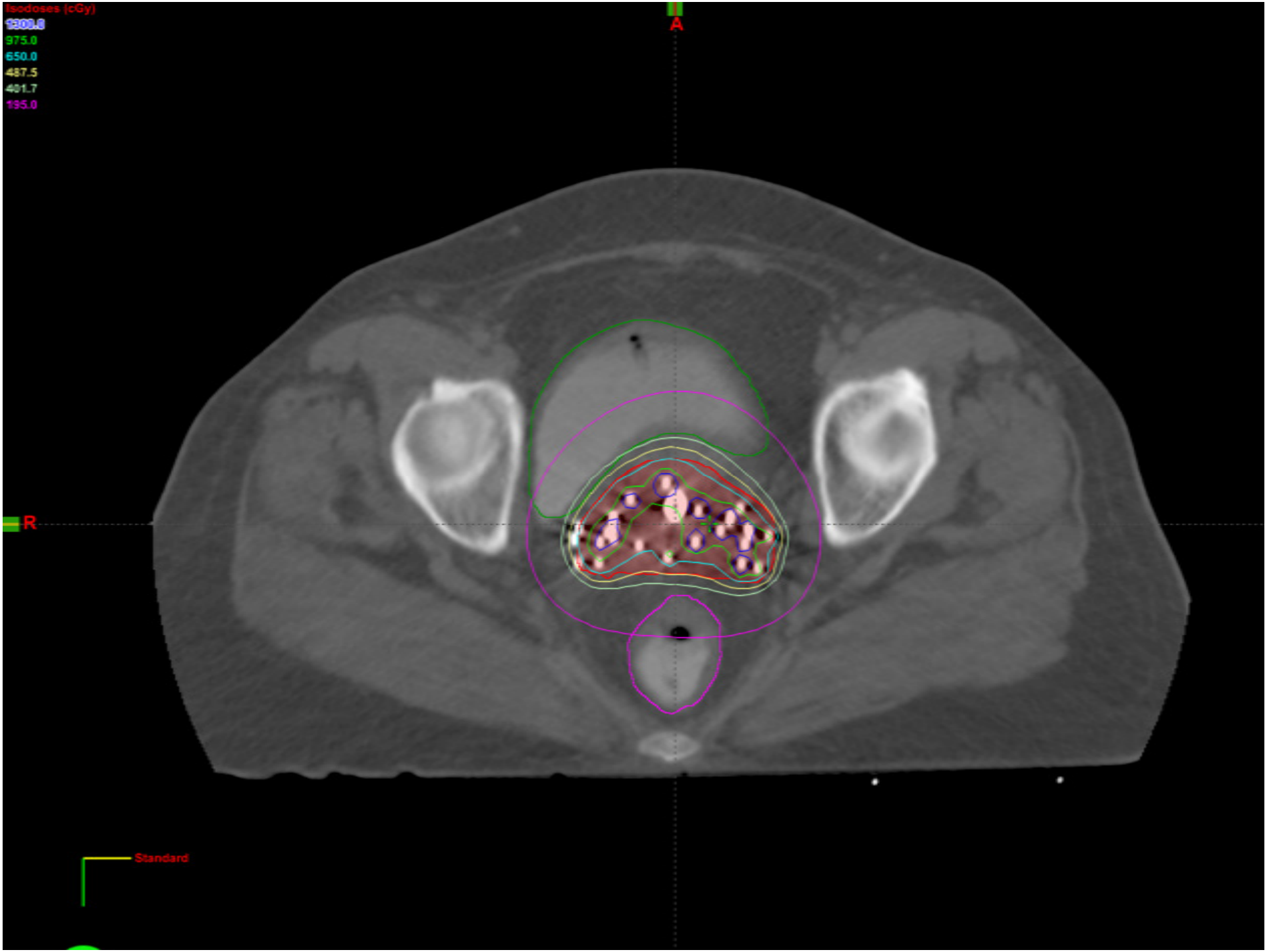

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

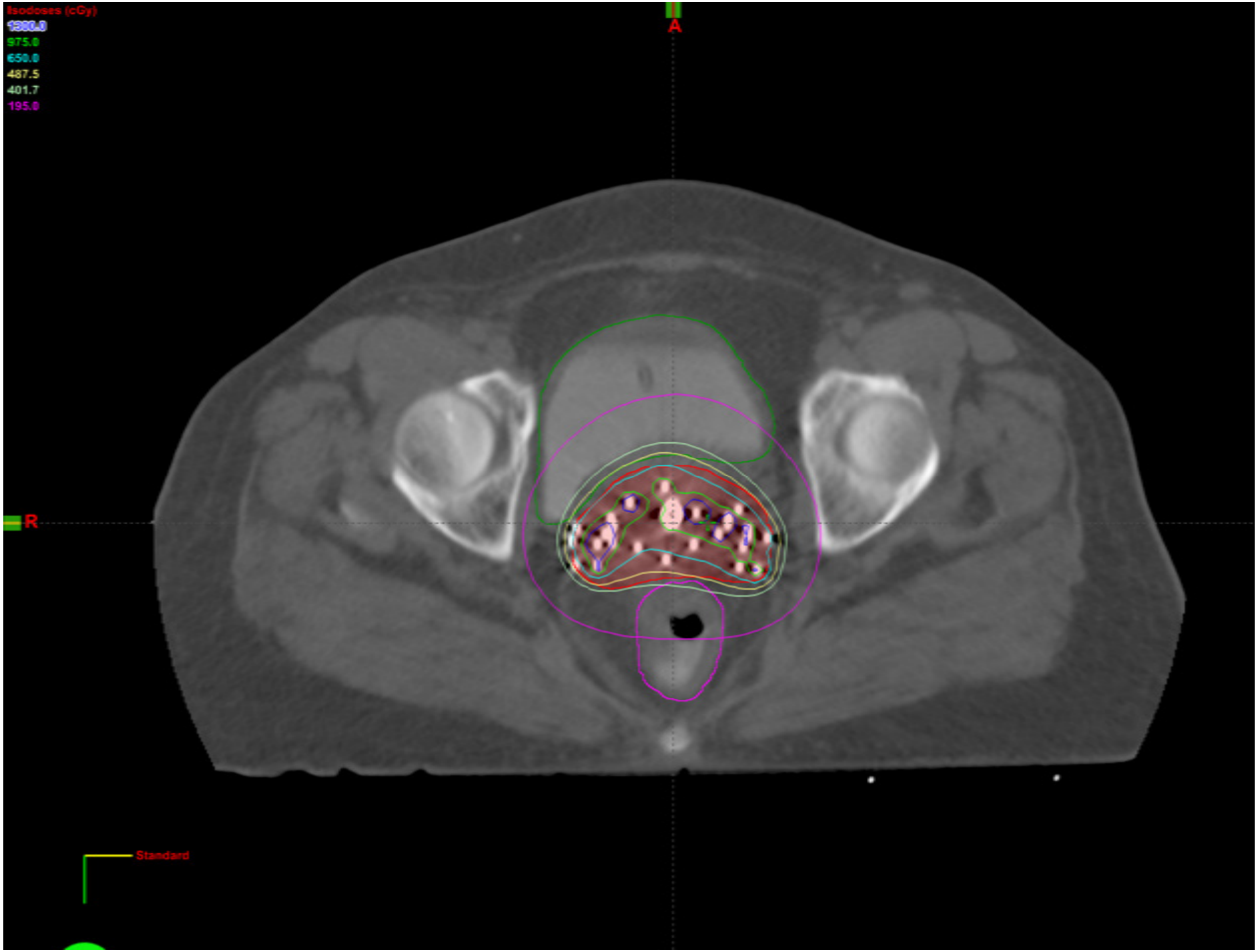

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
2.07 cm
Standard

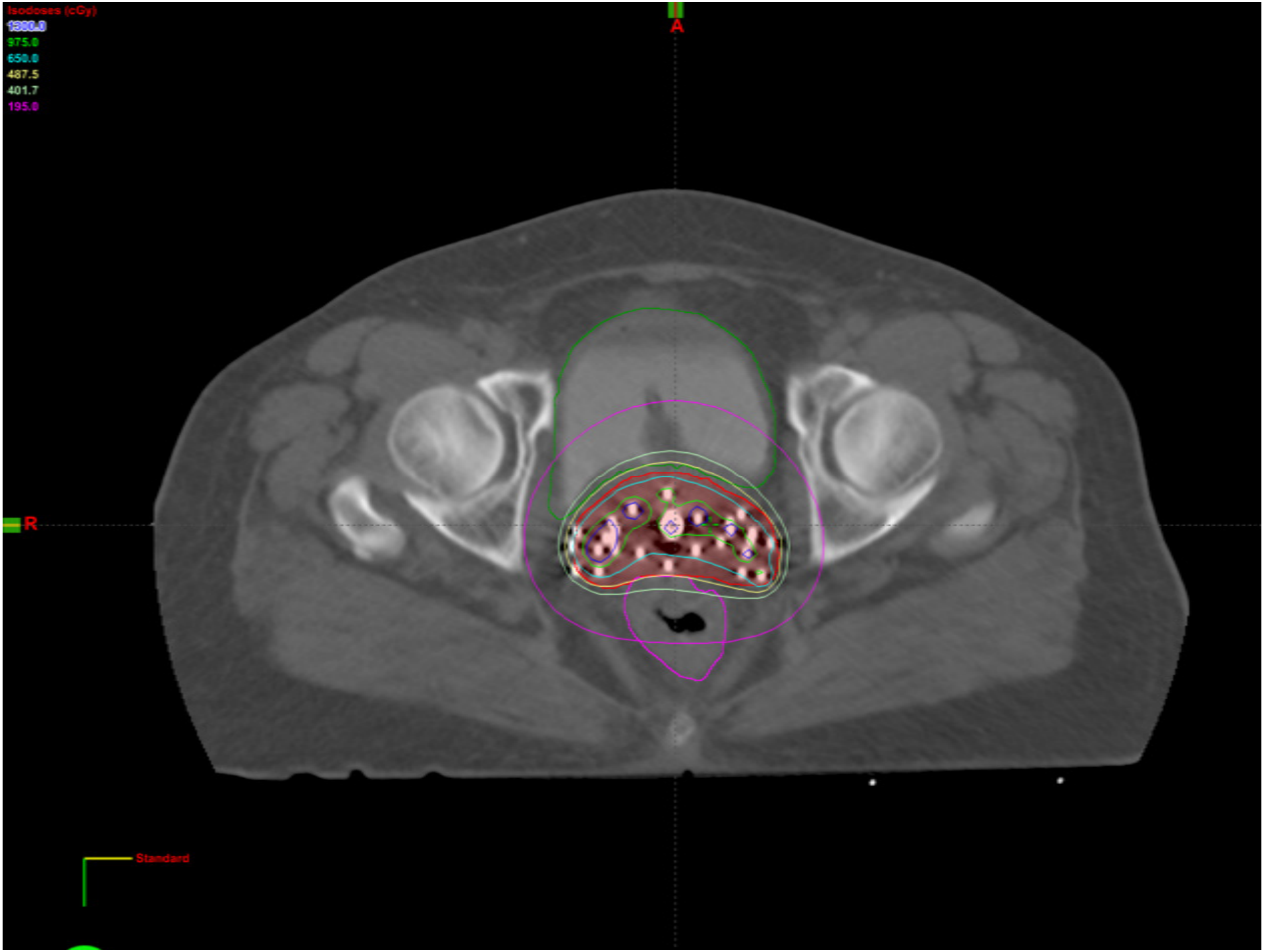

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

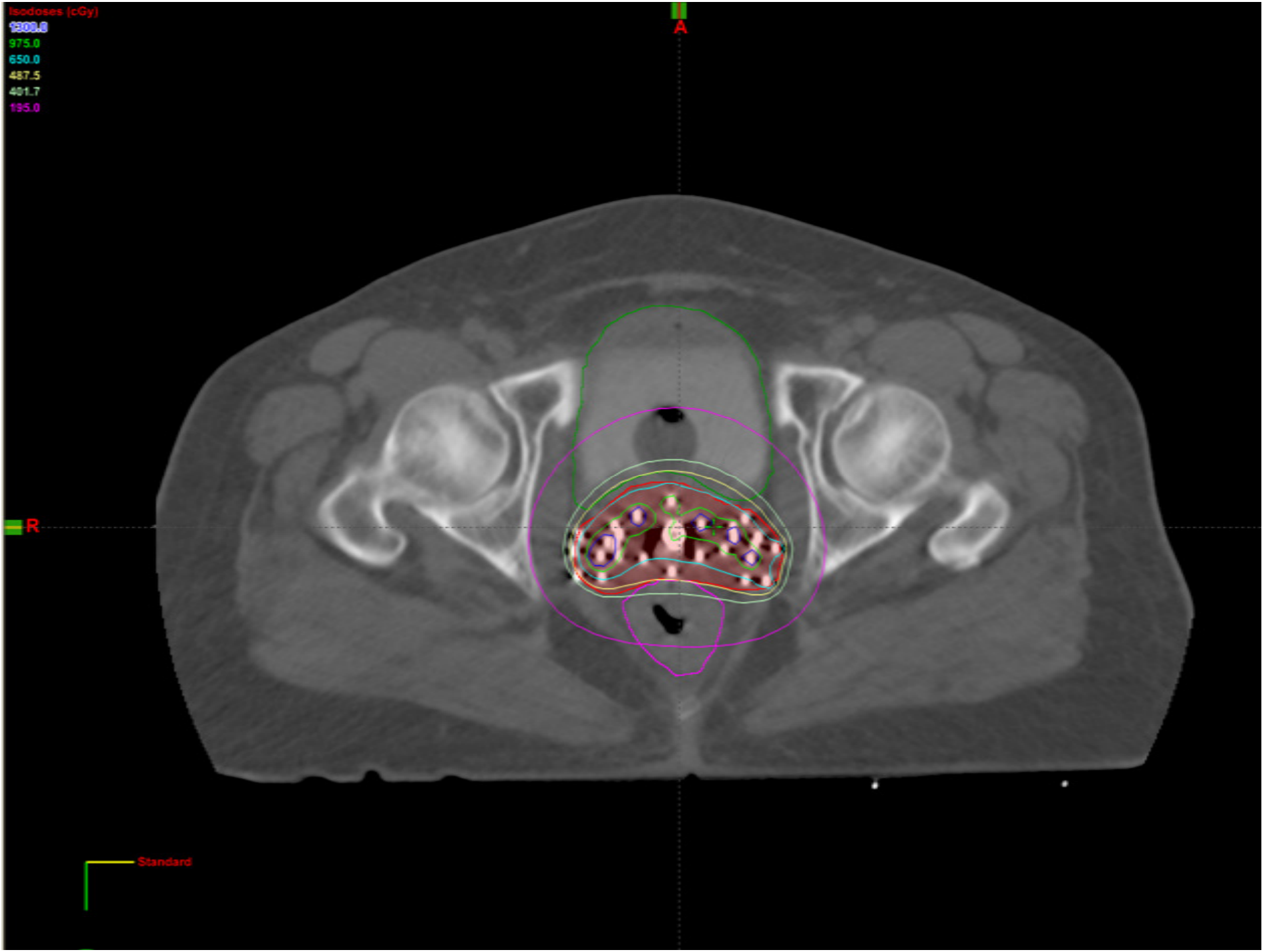

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

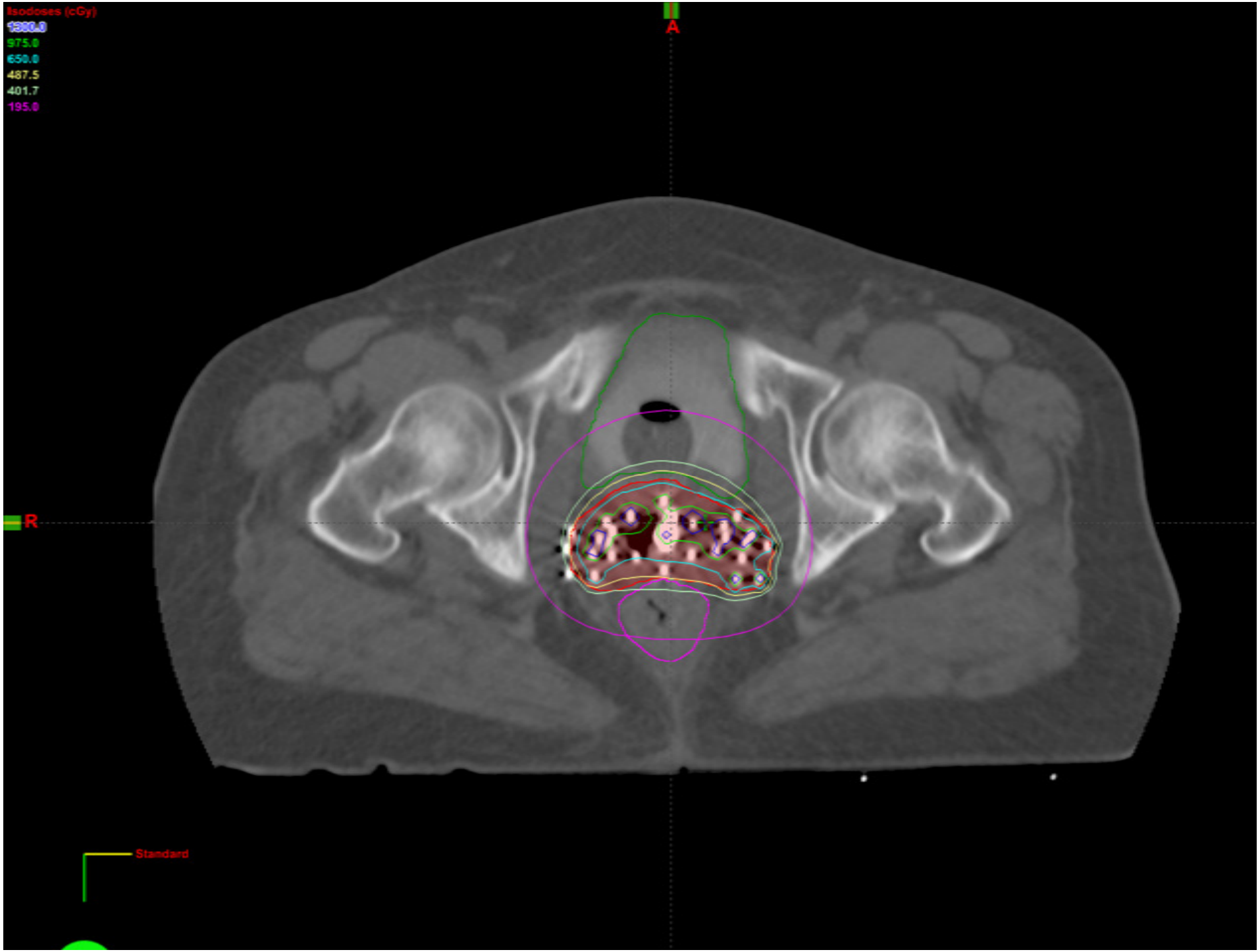

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

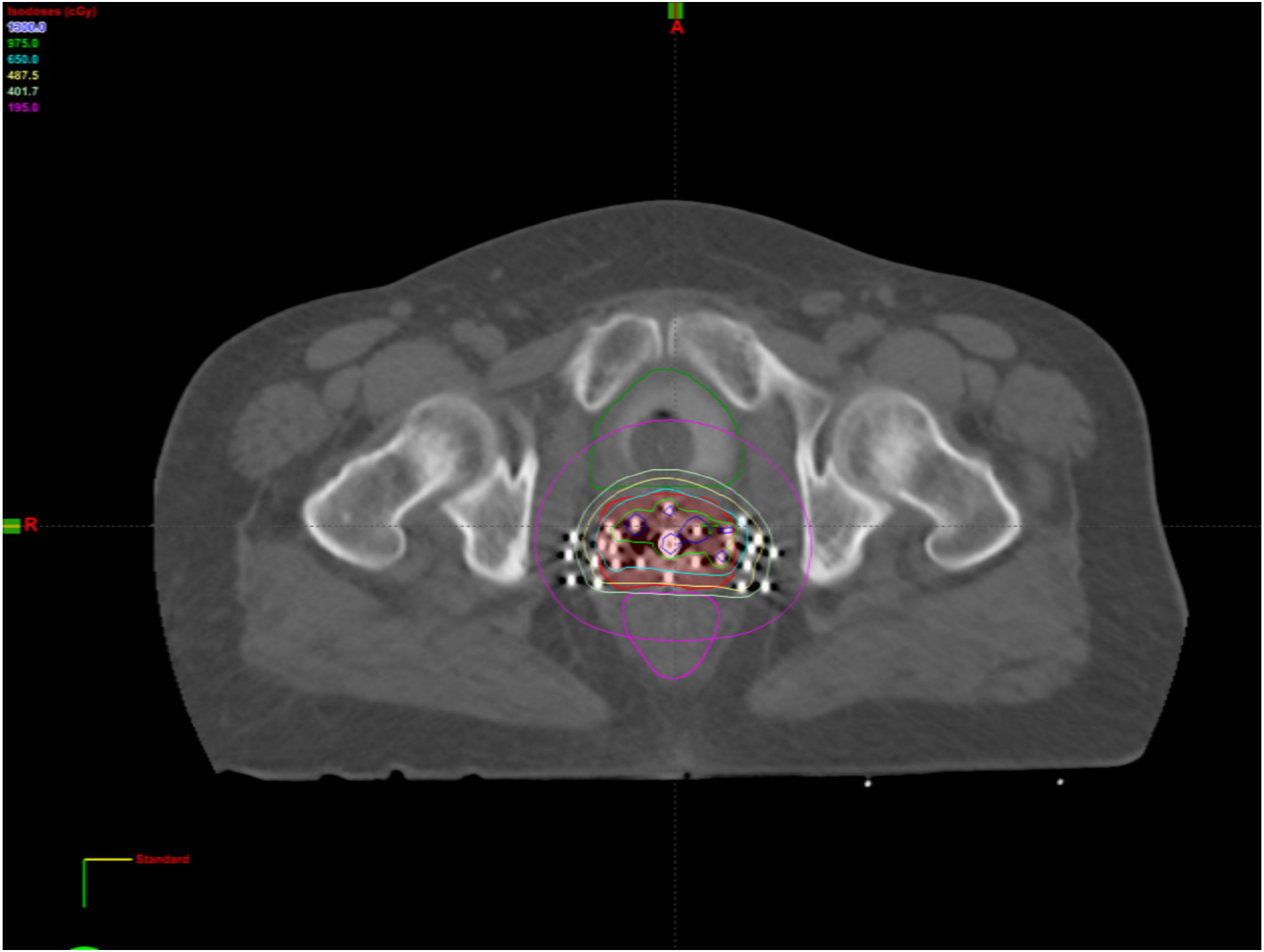

Isodoses (cGy)
1300.8
975.0
650.0
487.5
401.7
195.0
A
R
Standard

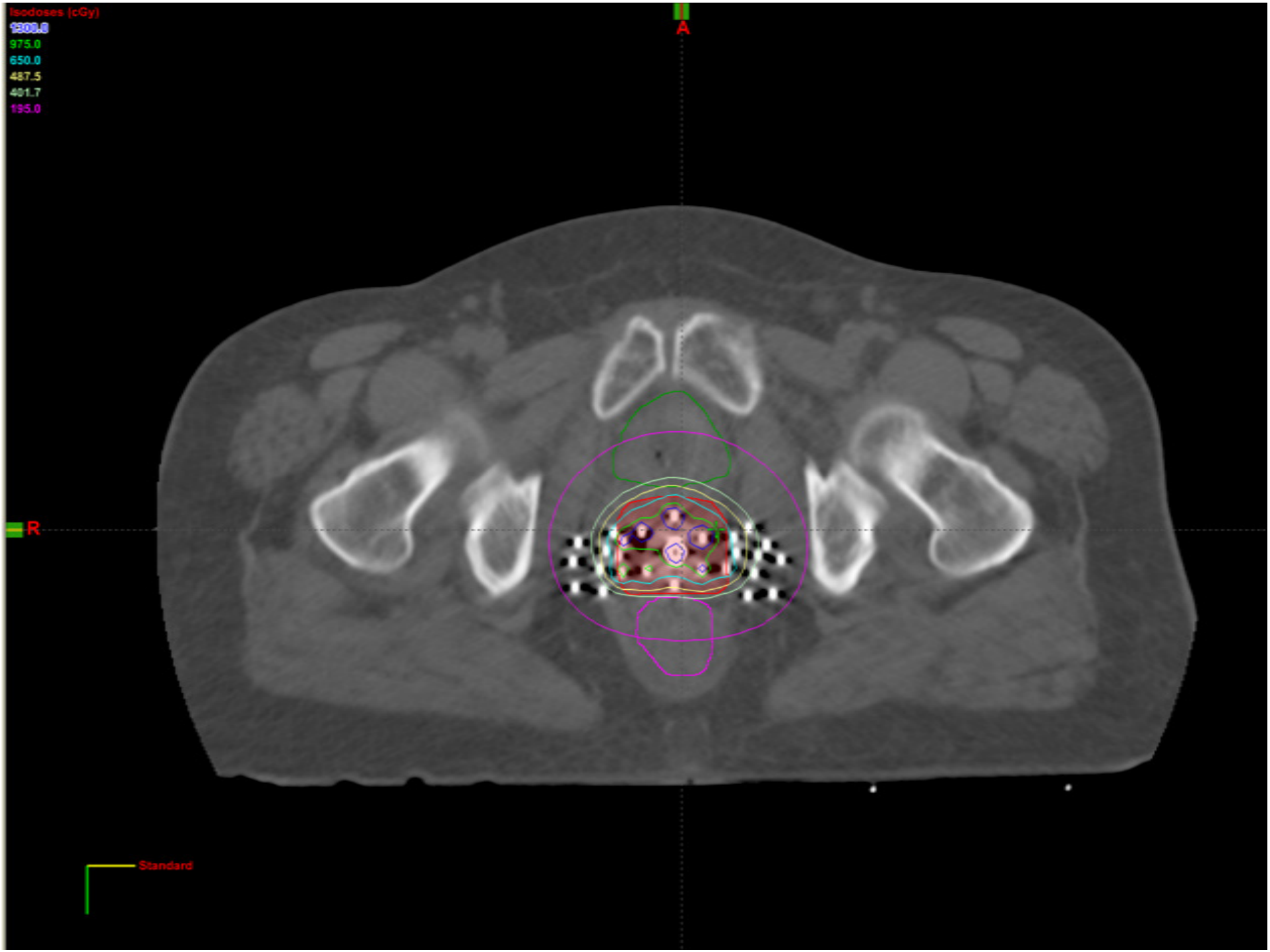

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

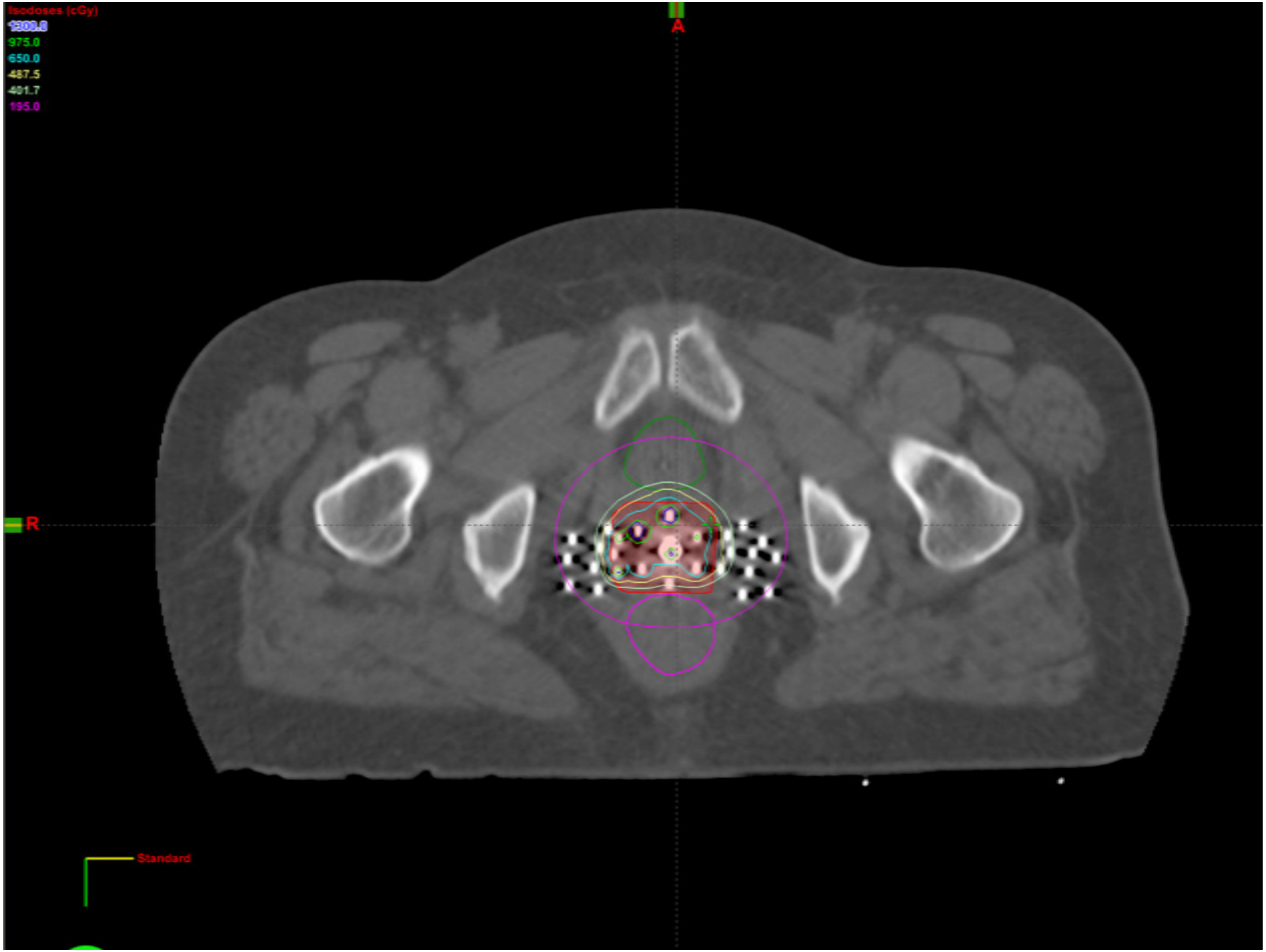

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

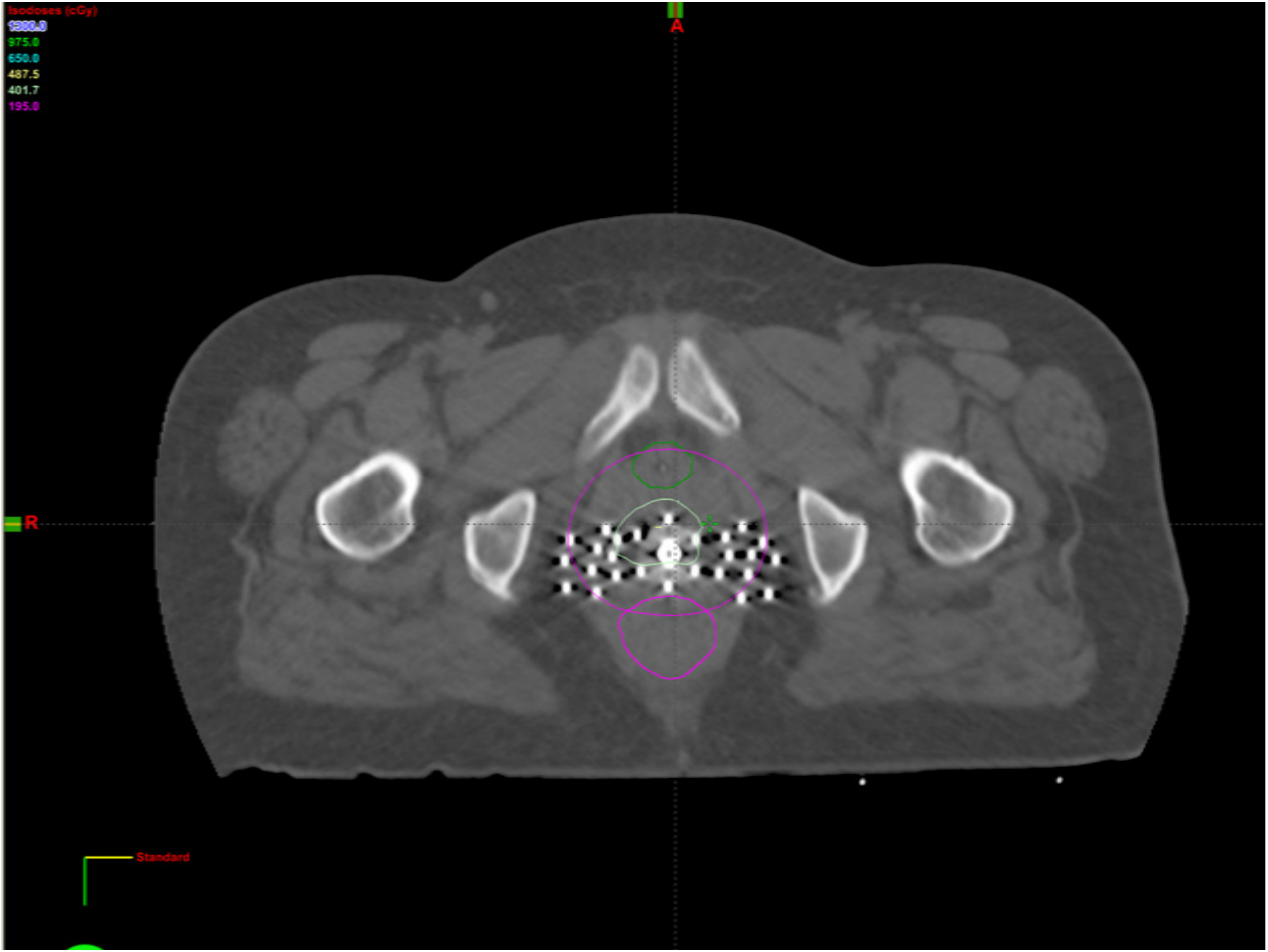

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

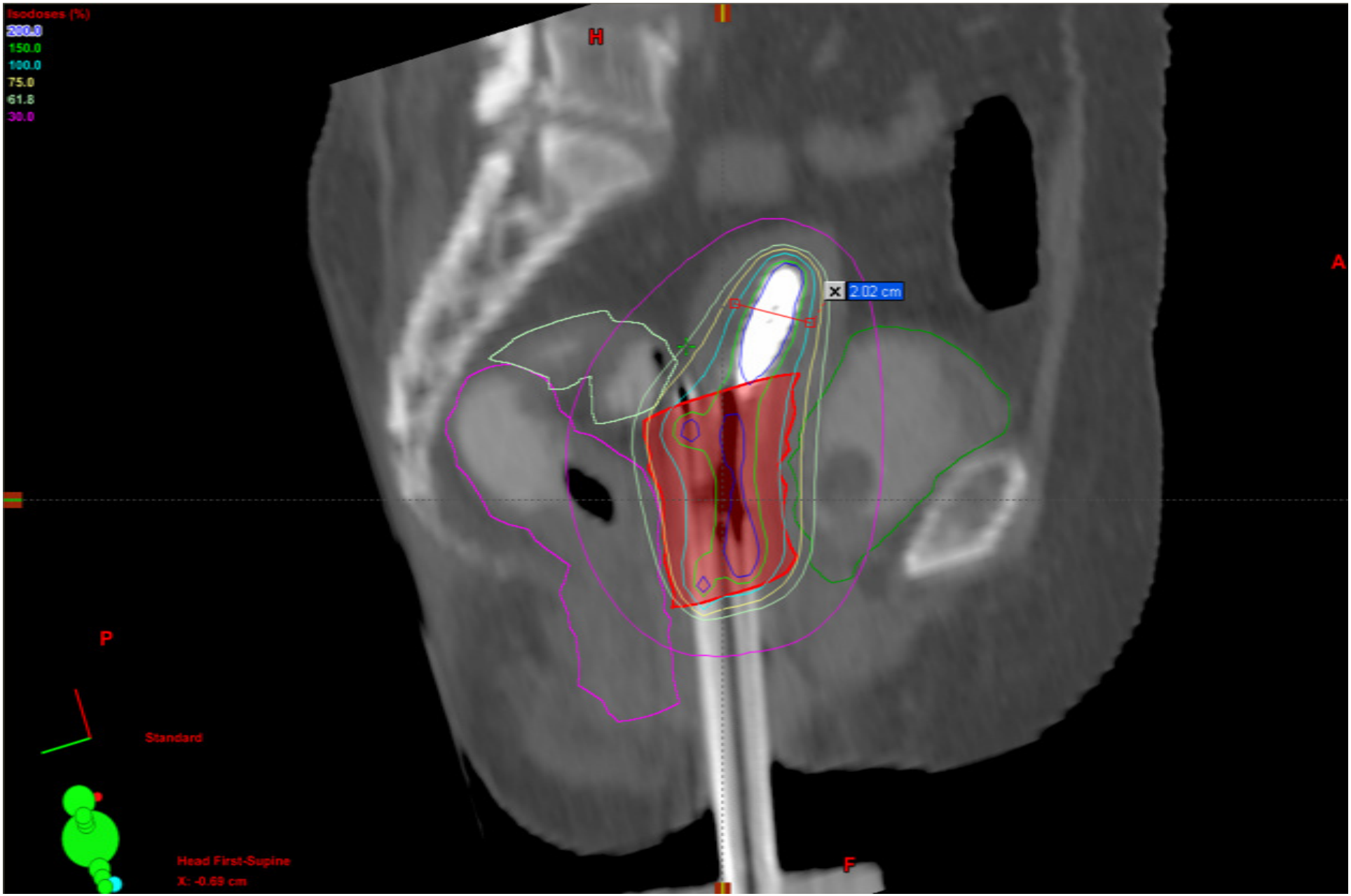

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

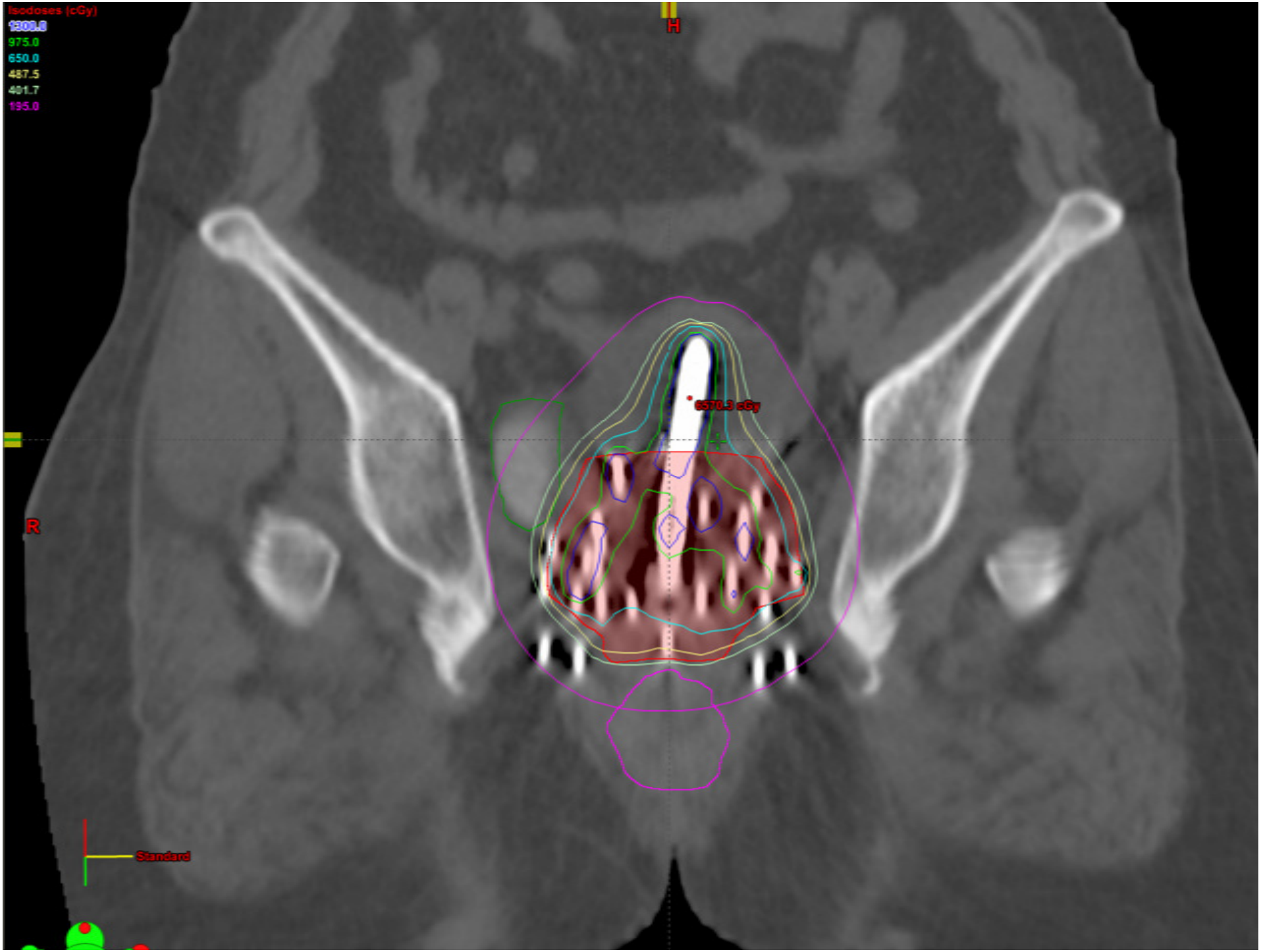

Isodoses (cGy)
1980.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

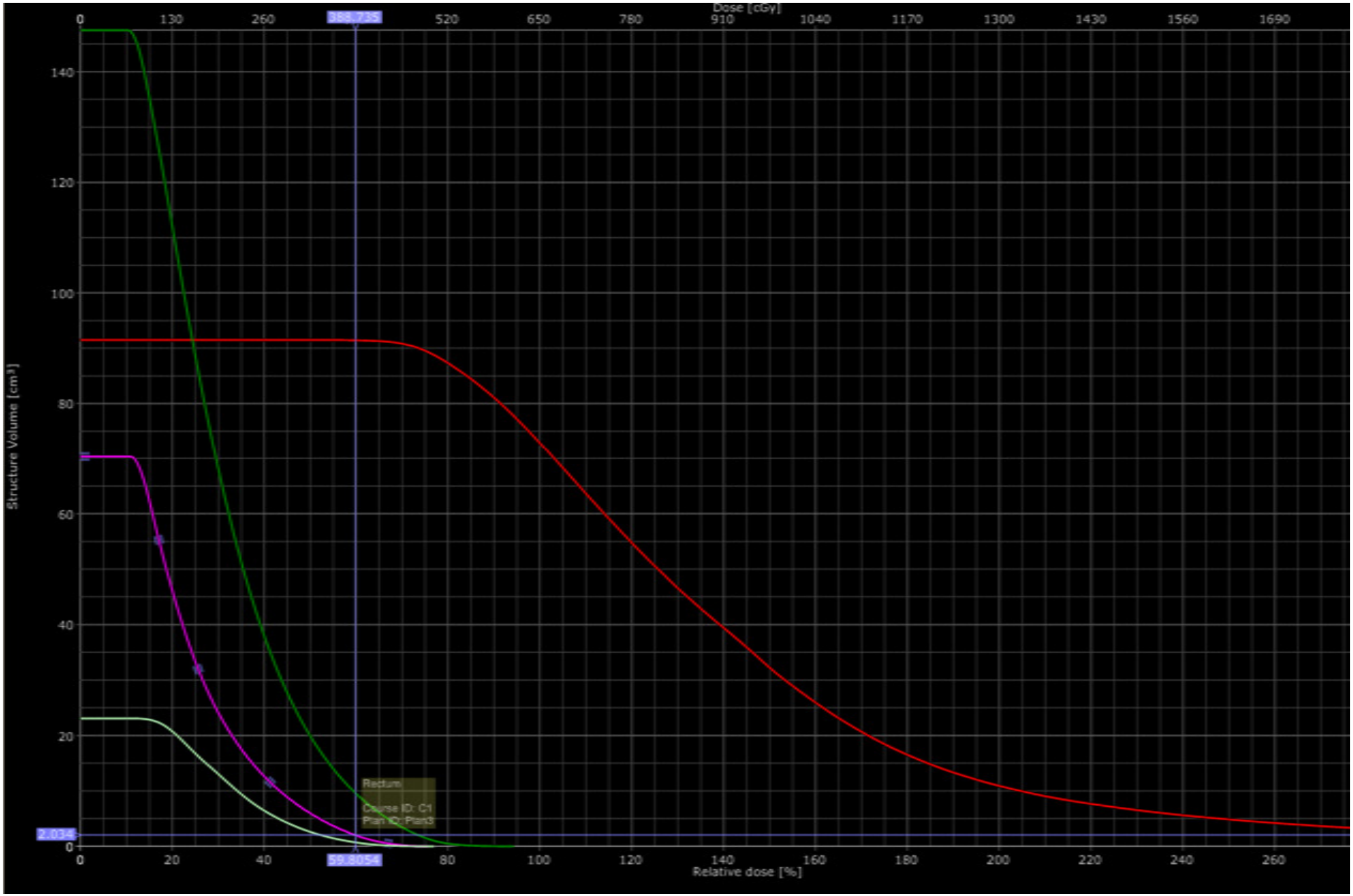

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard

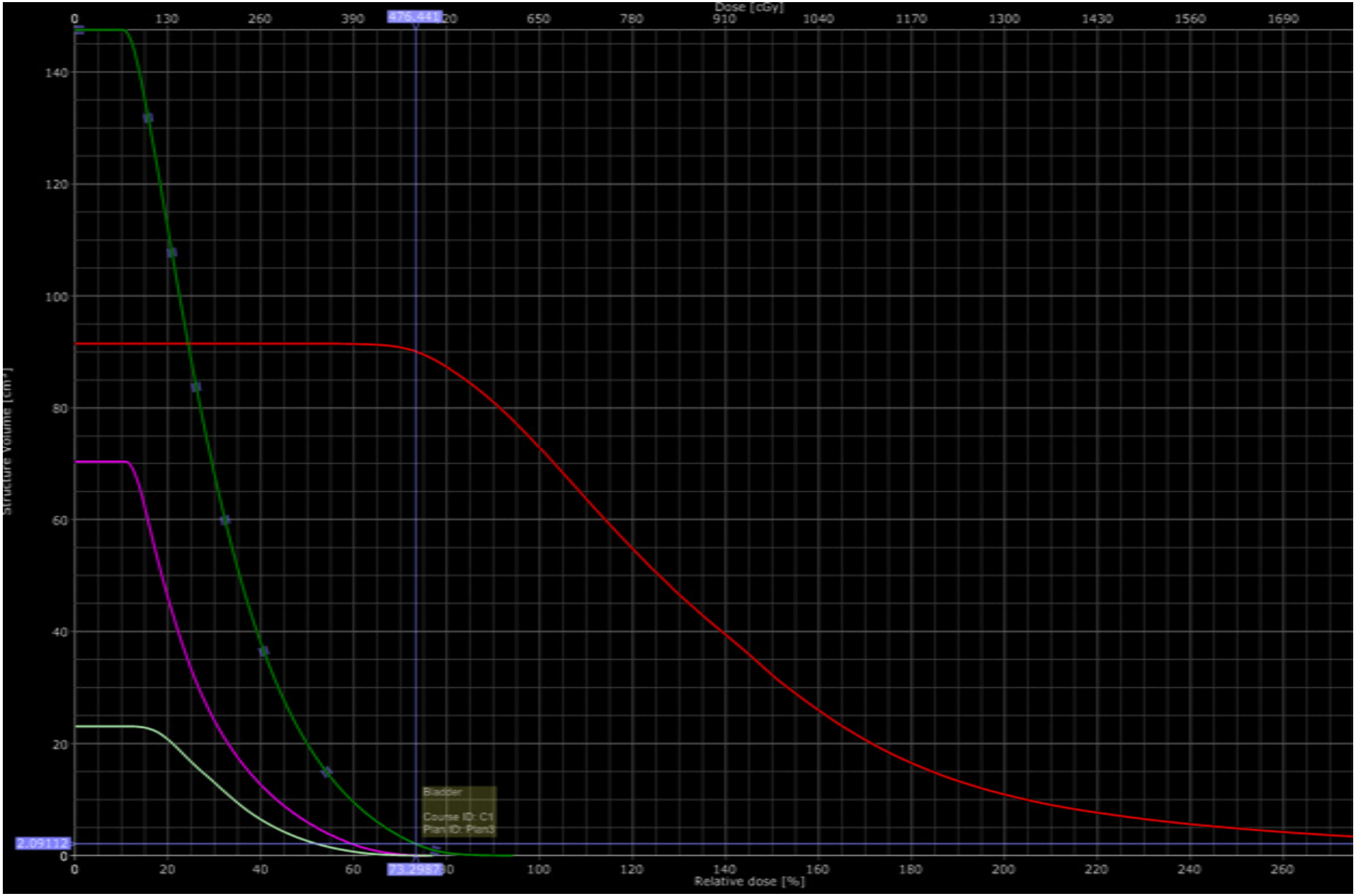

Isodoses (cGy)
1309.8
975.0
650.0
487.5
401.7
195.0
A
R
Standard

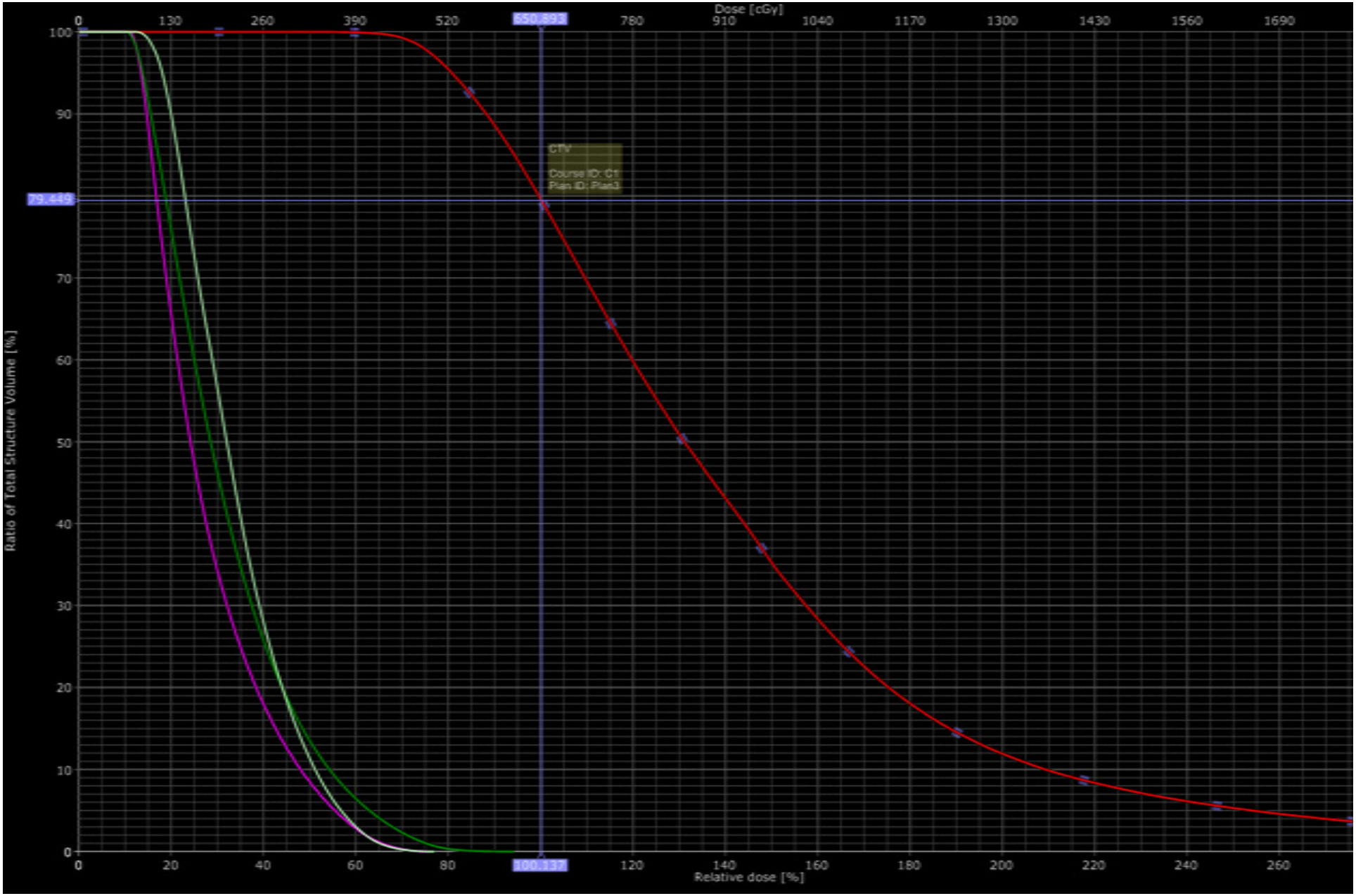

Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
A
R
Standard


Isodoses (%)
200.0
150.0
100.0
75.0
61.8
30.0
H
A
2.02 cm
P
Standard
Head First-Supine
X: -0.69 cm
F


Isodoses (cGy)
1300.0
975.0
650.0
487.5
401.7
195.0
H
6570.3 cGy
R
Standard


Dose [cGy]
0
130
260
388.735
520
650
780
910
1040
1170
1300
1430
1560
1690
Structure Volume [cm³]
140
120
100
80
60
40
20
0
2.0348
Rectum
Course ID: C1
Plan ID: Plan3
0
20
40
59.8054
80
100
120
140
160
180
200
220
240
260
Relative dose [%]

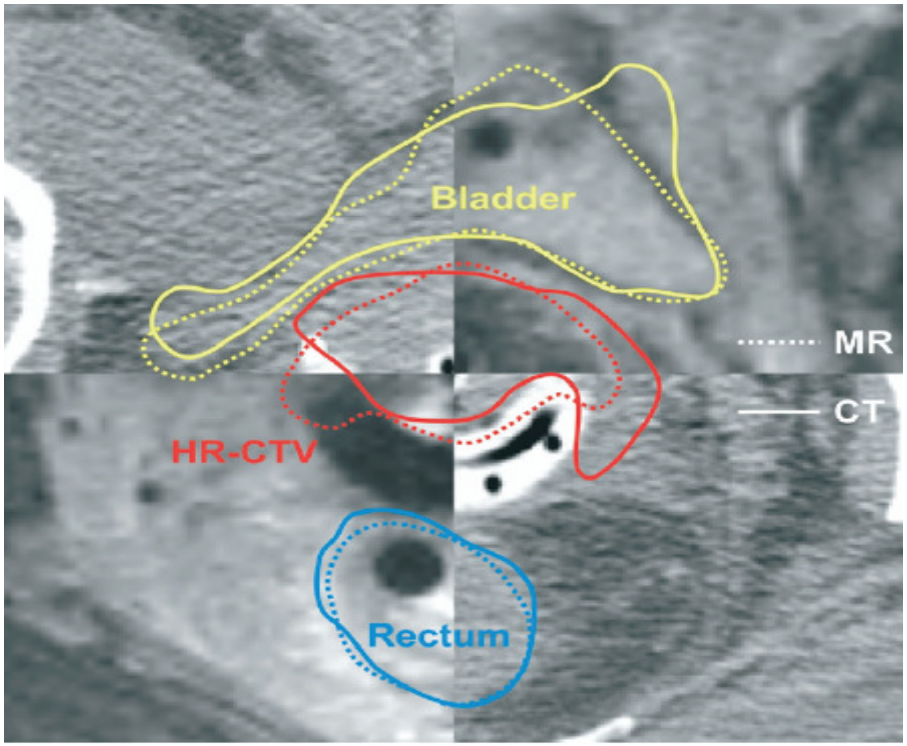

Dose [cGy]
0
130
260
390
476.441
650
780
910
1040
1170
1300
1430
1560
1690
Structure Volume [cm³]
140
120
100
80
60
40
20
2.09112
0
Bladder
Course ID: C1
Plan ID: Plan3
0
20
40
60
73.2987
100
120
140
160
180
200
220
240
260
Relative dose [%]

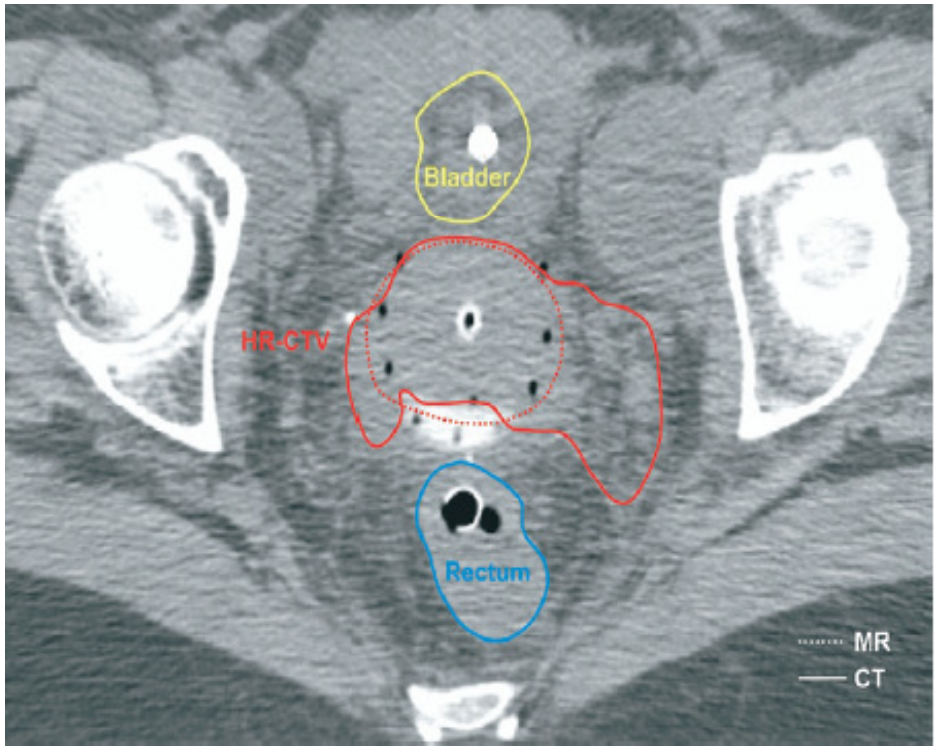

Dose [cGy]
0
130
260
390
520
650.893
780
910
1040
1170
1300
1430
1560
1690
100
90
79.449
70
60
50
40
30
20
10
0
Ratio of Total Structure Volume [%]
CTV
Course ID: C1
Plan ID: Plan3
0
20
40
60
80
100.137
120
140
160
180
200
220
240
260
Relative dose [%]

COMPUTED TOMOGRAPHY VERSUS MAGNETIC RESONANCE IMAGING-BASED CONTOURING IN CERVICAL CANCER BRACHYTHERAPY: RESULTS OF A PROSPECTIVE TRIAL AND PRELIMINARY GUIDELINES FOR STANDARDIZED CONTOURS

AKILA N. VISWANATHAN, M.D., M.P.H.,* JOHANNES DIMOPOULOS, M.D.,† CHRISTIAN KIRISITS, SC.D.,† DANIEL BERGER, M.SC.,† AND RICHARD PÖTTER, M.D.,†

*Department of Radiation Oncology, Brigham and Women's Hospital, Dana-Farber Cancer Institute, Boston, MA; †Department of Radiotherapy and Radiobiology, Medical University of Vienna, Vienna, Austria





Similar for OAR contouring

CT inferior for CTV delineation

Overestimation required to ensure adequate coverage

DOSE AND FRACTIONATION

- LDR – 40-60 Gy in 1-2 implants at 40-60 cGy/ hr using differential loading
- HDR –

ABS – 3 implants of 5.5 – 6Gy X 2 after 25-36 Gy XRT (Demanes et al)

Syed – 2 implants of 5-6Gy X 3 after 50.4 Gy XRT

Beriwal – 1 implant 3-3.5 Gy X 6-7 after 45Gy XRT

Vishwanathan -- 1 implant 2-3 Gy X 9-10 depending upon XRT dose

MANIPAL – 2 implants of 6.5 Gy X 2 after 45 Gy XRT

POST OPERATIVE CARE

- Analgesia – preferably epidural especially if single implant lasting 2-3 days

  Opiods
- Antibiotics
- Anticoagulant prophylaxis
- Anxiolytics
- Template shift

- Nutritional issues
- Hemorrhage – not an issue

TOXICITY

- Acute

→ Discomfort attributed to movement restriction

→ Pressure sores over thighs

→ Hemorrhage – not an issue

→ Infection

- Sub acute

→ Thromboembolism -- ? Prophylaxis

- Chronic – Proctitis, cystitis, sigmoiditis

REMOVAL

- Hemorrhage from implant site
- Hematuria – Hyperhydration
  Bladder irrigation
- Vasovagal attack
- Urinary retention

RESULTS

- January 2008- June 2010
- Minimum follow up – 6 months

  Median – 16 months (range 8-32)
- LRC IIIB 7/9 IIB 11/12 IB-IIA 7/8 25/29
- Proctitis – Gr I-II 2 Gr III-IV 0
- Cystitis – nil
- Sigmoid -- nil

FUTURE CHALLENGES

- Image guidance
- Artifact free needles
- Accurate contouring
- Faster treatment planning
- Outcome data
- Patient comfort

A DOSE–VOLUME ANALYSIS OF MAGNETIC RESONANCE IMAGING-AIDED HIGH-DOSE-RATE IMAGE-BASED INTERSTITIAL BRACHYTHERAPY FOR UTERINE CERVICAL CANCER

KEN YOSHIDA, M.D.,* HIDEYA YAMAZAKI, M.D.,† TADASHI TAKENAKA, R.T.T.,* TADAYUKI KOTSUMA, M.D.,* MINEO YOSHIDA, M.D.,* SEIICHI FURUYA, M.D.,‡ EIICHI TANAKA, M.D.,* TADAAKI UEGAKI, R.T.T.,* KEIKO KURIYAMA, M.D.,* HISANOBU MATSUMOTO, M.D.,§ SHIGETOSHI YAMADA, M.D.,§ AND CHIAKI BAN, M.D.§

Departments of *Radiology, §Obstetrics and Gynecology, National Hospital Organization Osaka National Hospital, Osaka; †Department of Radiology, Kyoto Prefectural University of Medicine; and ‡Louis Pasteur Center for Medical Research, Kyoto, Japan

Ambulatory technique


TUMBA THANKS
रेल मोटर कार 4


Any questions?