

## Refresher Kurs

# Bildgestützte gynäkologische Brachytherapie

Klinik für Strahlentherapie, LMU Klinikum  
30.08.2023 | PD Dr. Stefanie Corradini



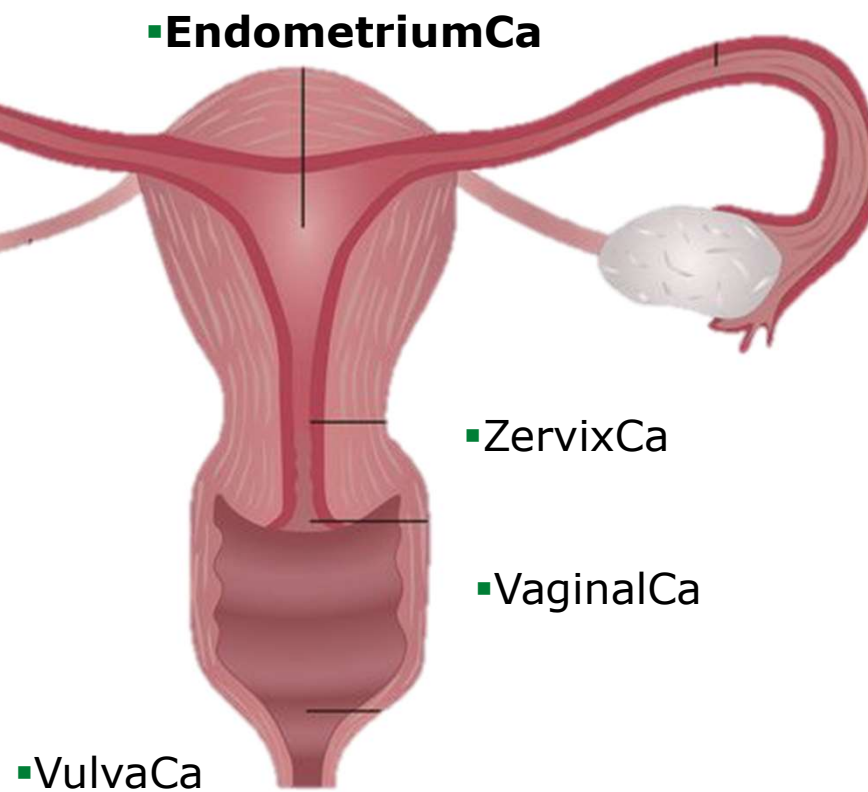
# Interessenkonflikte

I ♥ Brachy



# Gynäkologische Tumore

## Agenda



## Risikostratifizierung nach histopathologischen Kriterien

### HOW IT STARTED

| Risikogruppe           | Charakteristika                                                                                                                                                                                               |
|------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low risk               | endometrioides EC, G1, G2, < 50 % myometrane Infiltration, L0                                                                                                                                                 |
| Low-intermediate risk  | endometrioides EC, G1, G2, ≥ 50 % myometrane Infiltration, L0                                                                                                                                                 |
| High-intermediate risk | endometrioides EC, G3, < 50 % myometrane Infiltration, L0 oder L1<br>endometrioides EC, G1, G2, L1, </≥ 50 % myometrane Infiltration                                                                          |
| High risk              | endometrioides EC, G3, ≥ 50 % myometrane Infiltration, L0 oder L1, FIGO/TNM-Stadium II/T2<br>endometrioides EC, FIGO/TNM-Stadium III/T3, R0<br>non-endometrioides EC (serös/klarzellig, undifferenziert, MMT) |

## Indikationsstellung nach molekularpathologischen Kriterien

- DNA polymerase epsilon (POLE) exonuclease domain ultramutated (POLEmut)
- p53 abnormal (p53abn)
- mismatch repair deficient (MMRd) – causing microsatellite instability (MSI)
- no specific molecular profile (NSMP)

### ESGO/ESTRO/ESP guidelines for the management of patients with endometrial carcinoma

# HOW IT'S GOING

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Nicole Concin <sup>1,2</sup> Xavier Matias-Guiu,<sup>3,4</sup> Ignace Vergote,<sup>5</sup> David Cibula,<sup>6</sup> Mansoor Raza Mirza,<sup>7</sup> Simone Marnitz,<sup>8</sup> Jonathan Ledermann <sup>9</sup> Tjalling Bosse,<sup>10</sup> Cyrus Chargari,<sup>11</sup> Anna Fagotti,<sup>12</sup> Christina Fotopoulou <sup>13</sup> Antonio Gonzalez Martin,<sup>14</sup> Sigurd Lax,<sup>15,16</sup> Domenica Lorusso,<sup>12</sup> Christian Marth,<sup>17</sup> Philippe Morice,<sup>18</sup> Remi A Nout,<sup>19</sup> Dearbhaile O'Donnell,<sup>20</sup> Denis Querleu <sup>12,21</sup> Maria Rosaria Raspollini,<sup>22</sup> Jalid Sehouli,<sup>23</sup> Alina Sturdza,<sup>24</sup> Alexandra Taylor,<sup>25</sup> Anneke Westermann,<sup>26</sup> Pauline Wimberger,<sup>27</sup> Nicoletta Colombo,<sup>28</sup> François Planchamp,<sup>29</sup> Carien L Creutzberg<sup>30</sup>



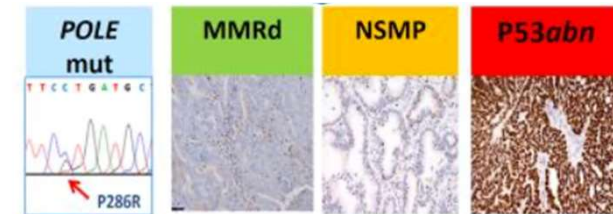
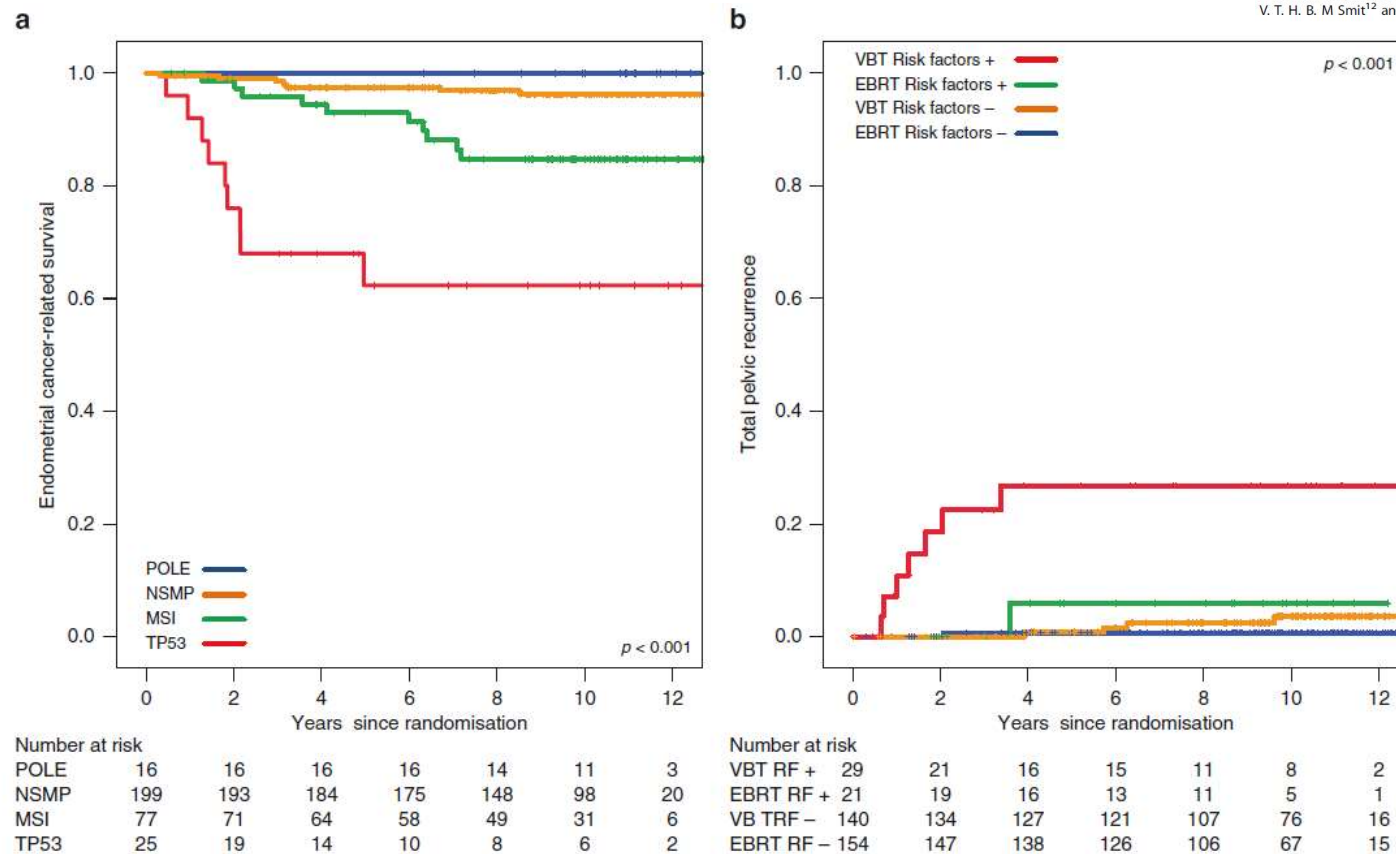
# PORTEC 2 10 Jahres-Daten

## ARTICLE

Clinical Study

Ten-year results of the PORTEC-2 trial for high-intermediate risk endometrial carcinoma: improving patient selection for adjuvant therapy

B. G. Wortman<sup>1</sup>, C. L. Creutzberg<sup>1</sup>, H. Putter<sup>2</sup>, I. M. Jürgenliemk-Schulz<sup>3</sup>, J. J. Jobsen<sup>4</sup>, L. C. H. W. Lutgens<sup>5</sup>, E. M. van der Steen-Banasik<sup>6</sup>, J. W. M. Mens<sup>7</sup>, A. Slot<sup>8</sup>, M. C. Stenfort Kroese<sup>9</sup>, B. van Triest<sup>10</sup>, H. W. Nijman<sup>11</sup>, E. Stelloo<sup>12</sup>, T. Bosse<sup>12</sup>, S. M. de Boer<sup>1</sup>, W. L. J. van Putten<sup>13</sup>, V. T. H. B. M. Smit<sup>12</sup> and R. A. Nout<sup>1</sup> for the PORTEC Study Group



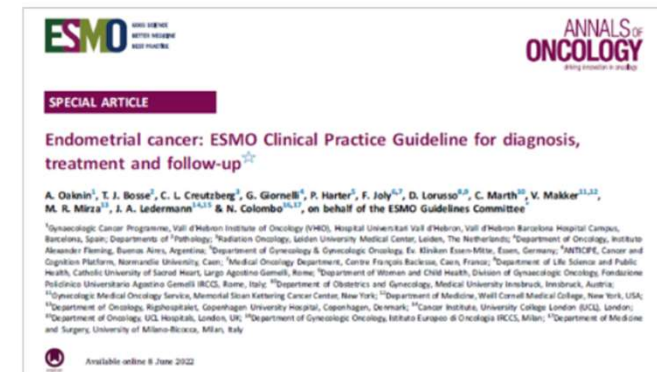
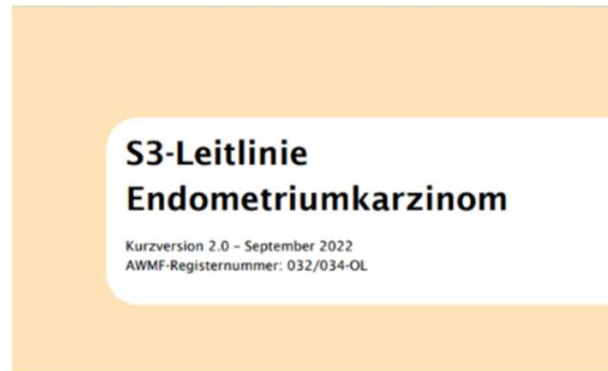
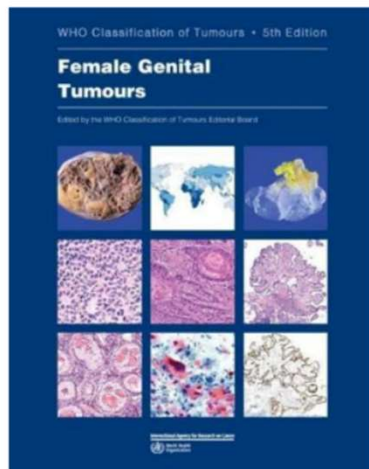
**Fig. 3** **a** Endometrial cancer-related survival by 4 molecular subgroups. **b** Total pelvic recurrence by unfavourable risk factors (LVSI, p53-mutant or L1CAM expression)

# Indikationsstellung

## nach molekularpathologischen Kriterien

| Risk group          | Molecular classification unknown                                                                                                                                                                                                                                                                                                 | Molecular classification known*†                                                                                                                                                                                                                                                                                                                                                                            |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Low                 | <ul style="list-style-type: none"> <li>▶ Stage IA endometrioid + low-grade‡ + LVSI negative or focal</li> </ul>                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>▶ Stage I-II <b>POLEmut</b> endometrial carcinoma, no residual disease</li> <li>▶ Stage IA <b>MMRd/NSMP</b> endometrioid carcinoma + low-grade‡ + LVSI negative or focal</li> </ul>                                                                                                                                                                                  |
| Intermediate        | <ul style="list-style-type: none"> <li>▶ Stage IB endometrioid + low-grade‡ + LVSI negative or focal</li> <li>▶ Stage IA endometrioid + high-grade‡ + LVSI negative or focal</li> <li>▶ Stage IA non-endometrioid (serous, clear cell, undifferentiated carcinoma, carcinosarcoma, mixed) without myometrial invasion</li> </ul> | <ul style="list-style-type: none"> <li>▶ Stage IB <b>MMRd/NSMP</b> endometrioid carcinoma + low-grade‡ + LVSI negative or focal</li> <li>▶ Stage IA <b>MMRd/NSMP</b> endometrioid carcinoma + high-grade‡ + LVSI negative or focal</li> <li>▶ Stage IA <b>p53abn</b> and/or non-endometrioid (serous, clear cell, undifferentiated carcinoma, carcinosarcoma, mixed) without myometrial invasion</li> </ul> |
| High-intermediate   | <ul style="list-style-type: none"> <li>▶ Stage I endometrioid + substantial LVSI regardless of grade and depth of invasion</li> <li>▶ Stage IB endometrioid high-grade‡ regardless of LVSI status</li> <li>▶ Stage II</li> </ul>                                                                                                 | <ul style="list-style-type: none"> <li>▶ Stage I <b>MMRd/NSMP</b> endometrioid carcinoma + substantial LVSI regardless of grade and depth of invasion</li> <li>▶ Stage IB <b>MMRd/NSMP</b> endometrioid carcinoma high-grade‡ regardless of LVSI status</li> <li>▶ Stage II <b>MMRd/NSMP</b> endometrioid carcinoma</li> </ul>                                                                              |
| High                | <ul style="list-style-type: none"> <li>▶ Stage III-IVA with no residual disease</li> <li>▶ Stage I-IVA non-endometrioid (serous, clear cell, undifferentiated carcinoma, carcinosarcoma, mixed) with myometrial invasion, and with no residual disease</li> </ul>                                                                | <ul style="list-style-type: none"> <li>▶ Stage III-IVA <b>MMRd/NSMP</b> endometrioid carcinoma with no residual disease</li> <li>▶ Stage I-IVA <b>p53abn</b> endometrial carcinoma with myometrial invasion, with no residual disease</li> <li>▶ Stage I-IVA <b>NSMP/MMRd</b> serous, undifferentiated carcinoma, carcinosarcoma with myometrial invasion, with no residual disease</li> </ul>              |
| Advanced metastatic | <ul style="list-style-type: none"> <li>▶ Stage III-IVA with residual disease</li> <li>▶ Stage IVB</li> </ul>                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>▶ Stage III-IVA with residual disease of any molecular type</li> <li>▶ Stage IVB of any molecular type</li> </ul>                                                                                                                                                                                                                                                    |

# Indikationsstellung Leitlinien



# Indikationsstellung

## S3 Leitlinie

### Herausforderungen

#### Beispiel adjuvante Therapie, pT1b G3 pN0

#### Kapitel Systemtherapie

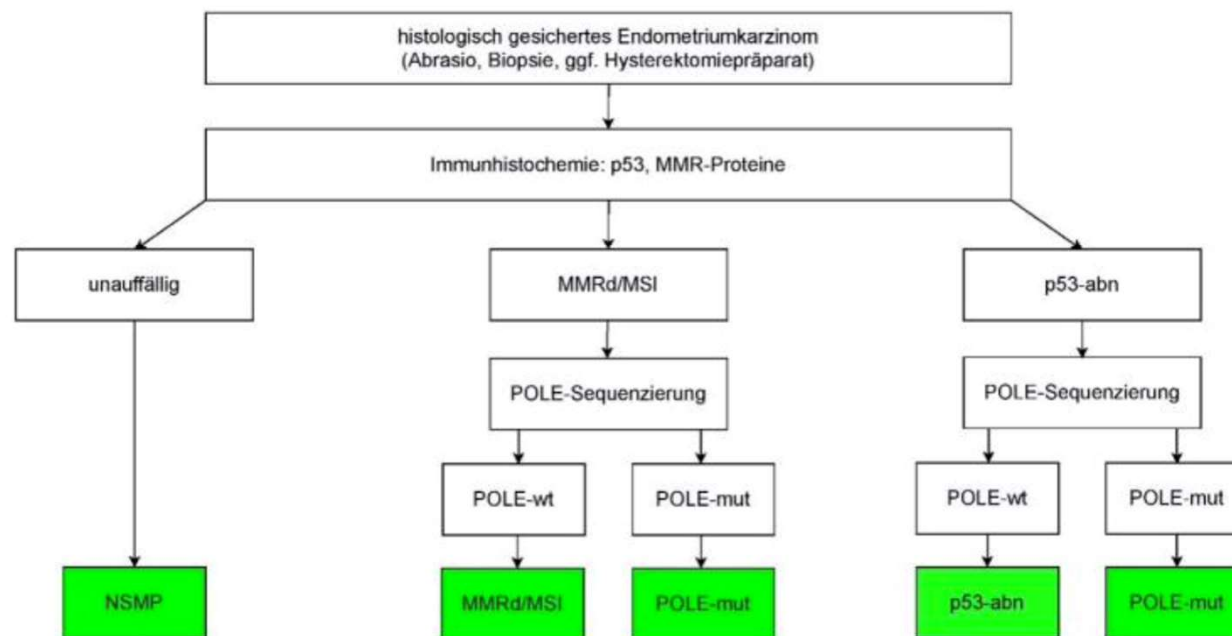
|     |                                                                                                                                                                                                                                                                                                                                                       |   |   |                                                  |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--------------------------------------------------|
| 8.4 | Bei Patientinnen mit Typ-I-Endometriumkarzinom G3 pT1b, ohne POLE-Mutation oder Stadium pT2 (jeweils pN0) kann eine adjuvante Chemotherapie mit 3 oder 6 Zyklen (s. Statement 8.13) <u>als Zusatz zur vaginalen Brachytherapie (s. Empfehlung Strahlentherapie) oder eine alleinige perkutane Strahlentherapie ohne Chemotherapie erwogen werden.</u> | 0 | 2 | <a href="#">[162]</a> ;<br><a href="#">[163]</a> |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|--------------------------------------------------|

#### Kapitel Strahlentherapie

|     |                                                                                                                                                                                               |   |   |                                                                                                   |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------------------------------------------------------------------------------|
| 7.8 | Bei Patientinnen mit endometrioidem Endometriumkarzinom (Typ I) im Stadium pT1b pN0 G3 (ohne LVSI und p53-wt und L1CAM negativ) soll eine <u>vaginale Brachytherapie</u> durchgeführt werden. | A | 3 | <a href="#">[93]</a> ;<br><a href="#">[157]</a> ;<br><a href="#">[158]</a> ; <a href="#">[95]</a> |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---|---------------------------------------------------------------------------------------------------|

# Indikationsstellung

## Molekulare Klassifikation



### Durchführung der Molekularen Klassifikation für alle Patientinnen

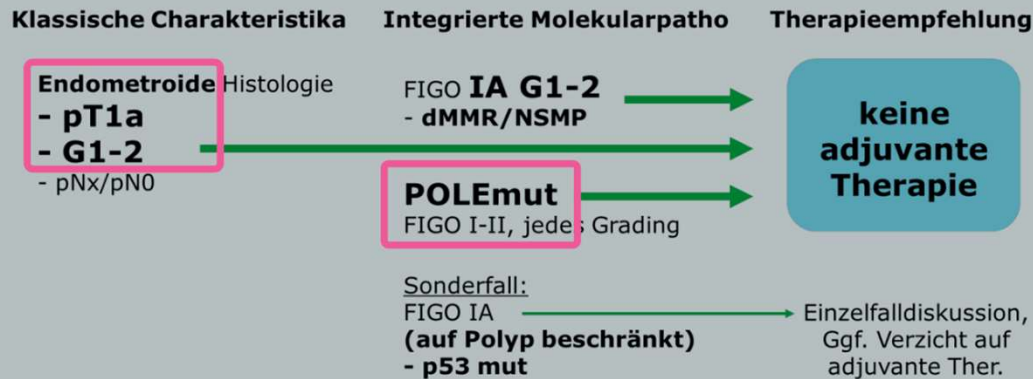
- wenn möglich am Abradat
- Immunhistochemie: p53, MMR
- Sequenzierung: POLE

NSMP = no special molecular profile; p53 = TP53; p53-abn = p53-abnorm; MMR = mismatch repair Proteine; MMRd = mismatch repair deficient; MSI = mikrosatelliteninstabil; POLE = Polymerase-Epsilon; - wt = Wildtyp; - mut = mutiert

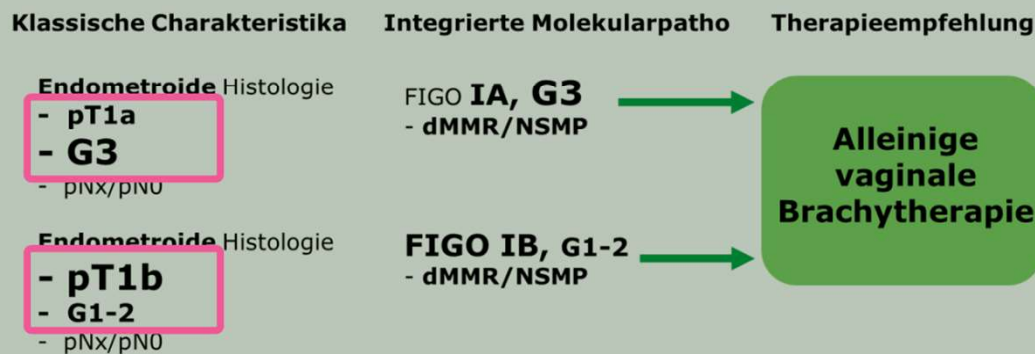
Cave: bei allen nach histologischen Kriterien EC mit intermediate, high intermediate oder high risk (Tabelle 11) soll POLE sequenziert werden.

# Entscheidungswege LMU-Strategie

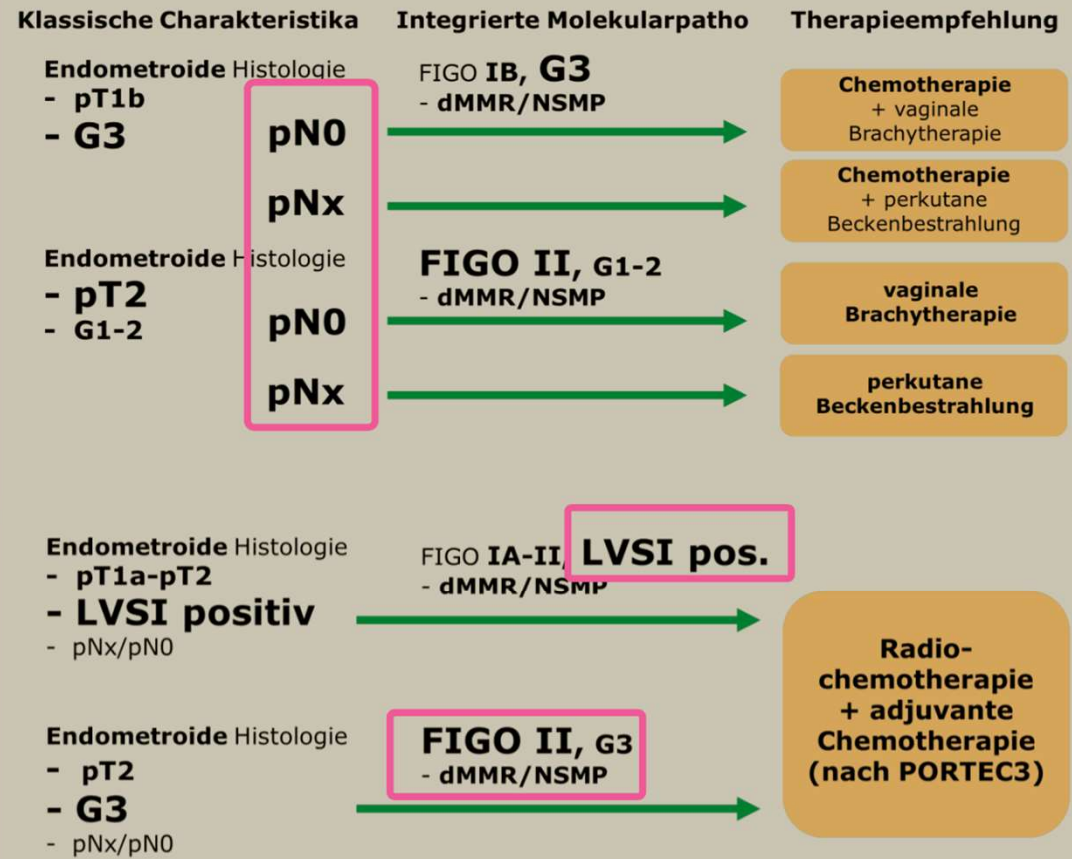
## Niedriges Risiko



## Intermediäres Risiko



## Intermediär-hohes Risiko

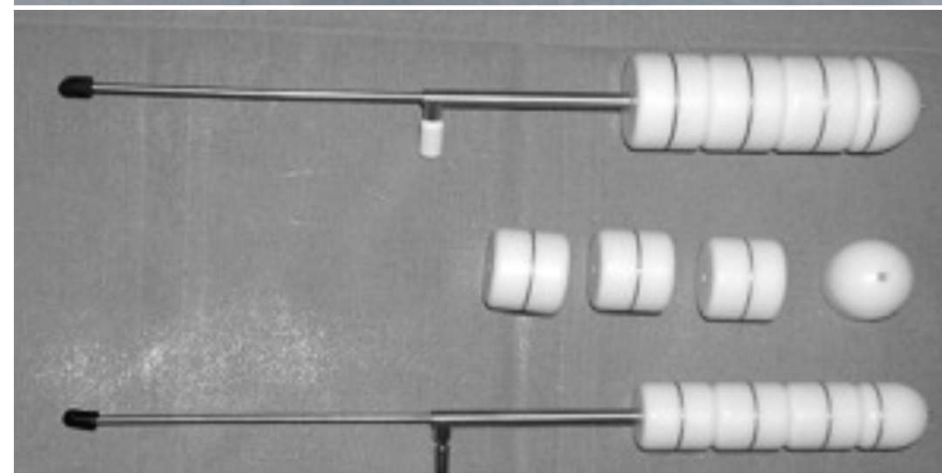
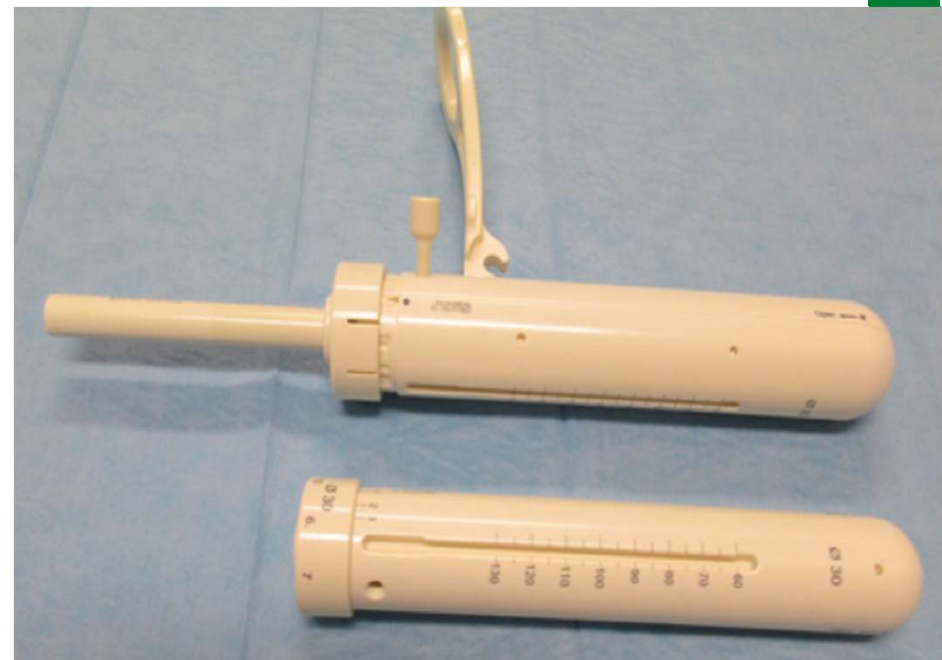
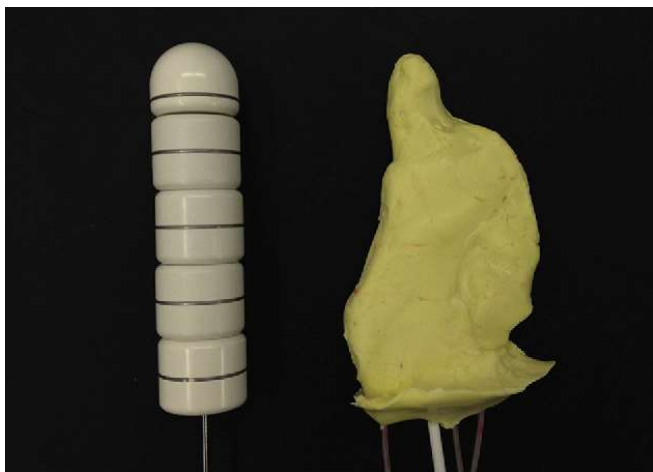


# Entscheidungswege LMU-Strategie

## Hohes Risiko

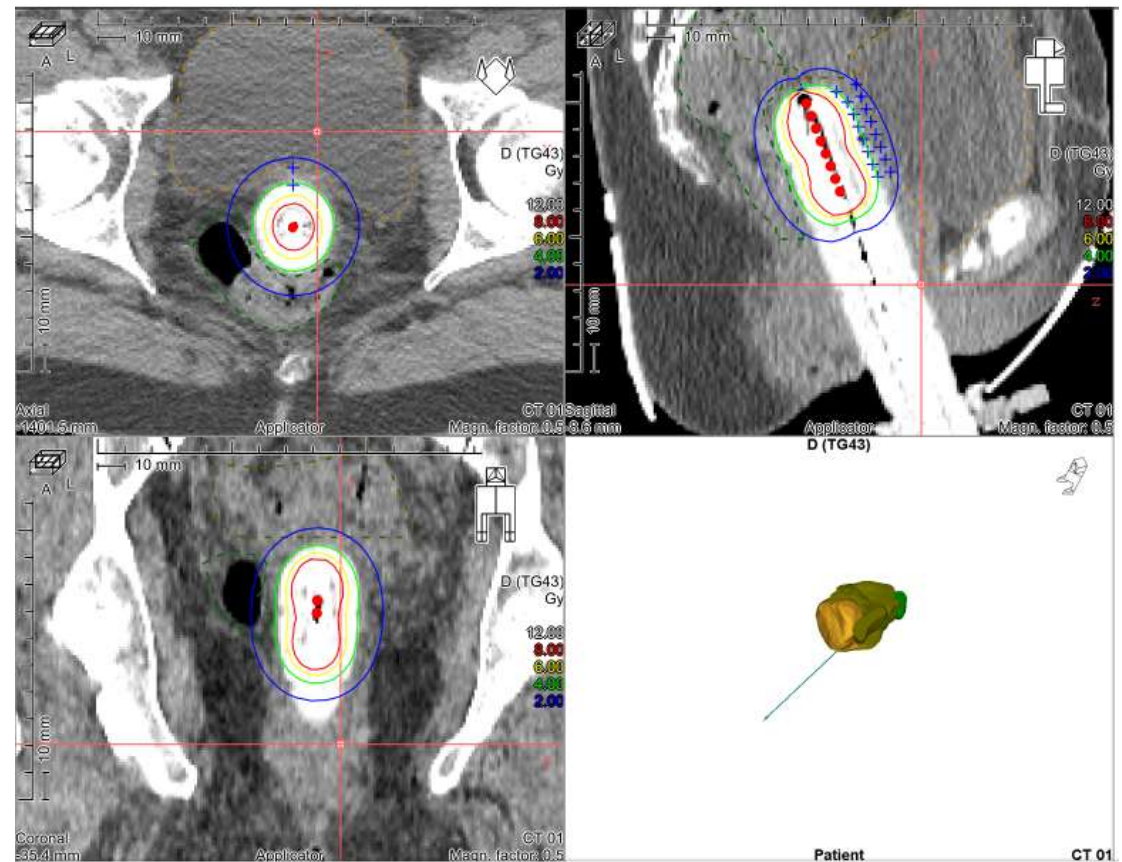
| Klassische Charakteristika                                                                                          | Integrierte Molekularpatho                                                                 | Therapieempfehlung                                                                                                     |
|---------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>Endometroide</b> Histologie<br>- pT1a-pT2<br>- pNx/pN0/pN1(pelvin)<br>- <b>pT3a/b</b><br>oder <b>pN1(pelvin)</b> | <b>FIGO IA-II, p53mut</b><br><b>FIGO IIIA-IIIIC1</b><br>(unabh. von molekularer Kategorie) | <b>Radio-chemotherapie + adjuvante Chemotherapie (nach PORTEC3)</b>                                                    |
| <b>Nicht-endometroide/Nicht-seröse</b> Histologie<br>- pT1a-pT3b<br>oder pN1(pelvin)                                | <b>FIGO I-IIIIC1</b><br>(unabh. von molekularer Kategorie)                                 |                                                                                                                        |
| <b>pN1(paraaortal)</b><br>(endometroide sowie nicht-endometroide/nicht-seröse Histologie)                           | <b>FIGO IIIC2</b><br>- NSMP/p53mut/POLE<br><b>- dMMR</b>                                   | <b>inkl. para-aortalem Feld</b><br>(wenn M0 nach PET-CT)<br><b>Chemo-Immuntherapie analog RUBY</b><br>(nach KÜ-Antrag) |
| <b>Seröse</b> Histologie<br>- pT1-pT3b,<br><b>pN0</b>                                                               | <b>FIGO I-IIIIB</b><br>(unabh. von molekularer Kategorie)                                  | <b>Alleinige Chemotherapie</b><br><b>falls Her2/neu-pos.: + Trastuzumab</b><br>(nach KÜ-Antrag)                        |
| <b>pN1</b><br>(pelv/para-aortal)                                                                                    | <b>FIGO IIIC1/C2</b><br>(unabh. von molekularer Kategorie)                                 |                                                                                                                        |
| <b>pT4</b><br>(alle Histologien)                                                                                    | <b>FIGO IVA</b><br>(unabh. von molekularer Kategorie)                                      | <b>Chemo-Immuntherapie analog RUBY</b><br>(nach KÜ-Antrag)                                                             |
| <b>pT1-4, M1</b><br>(alle Histologien)                                                                              | <b>FIGO IVB</b><br>(unabh. von molekularer Kategorie)                                      | <b>Chemo-Immuntherapie analog RUBY</b><br>oder <b>NRG-GY018</b><br>(nach KÜ-Antrag)                                    |
| <b>Messbare Erkrankung</b><br>(alle Histologien)                                                                    | <b>FIGO ≥ III</b><br>(unabh. von molekularer Kategorie)                                    |                                                                                                                        |

## Durchführung Vaginale Brachytherapie

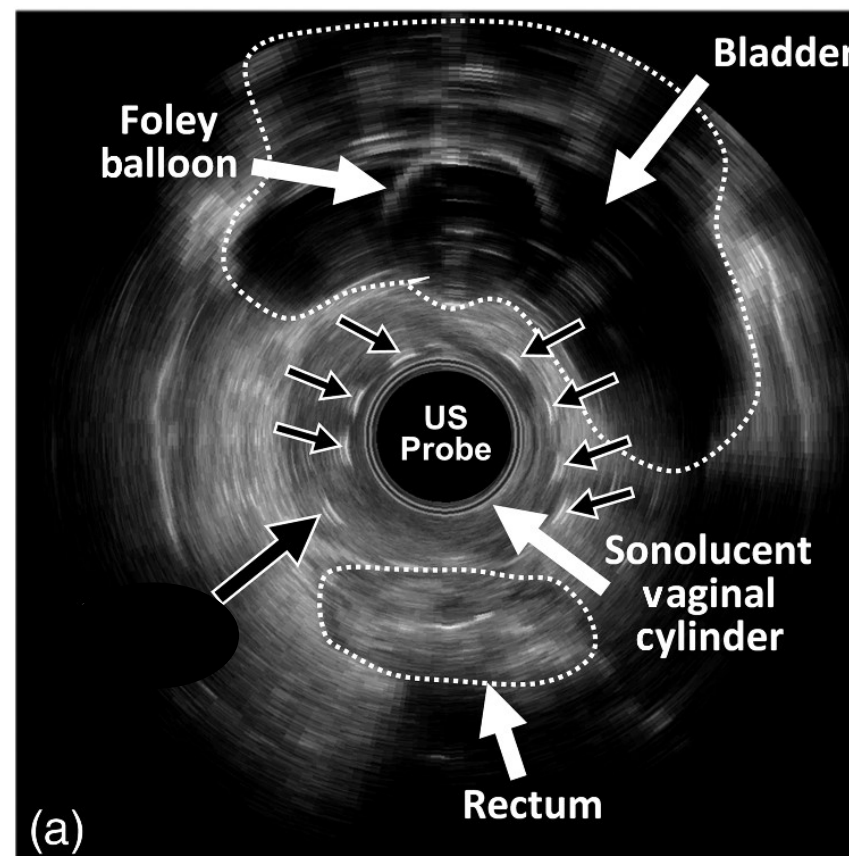


# Durchführung Vaginale Brachytherapie

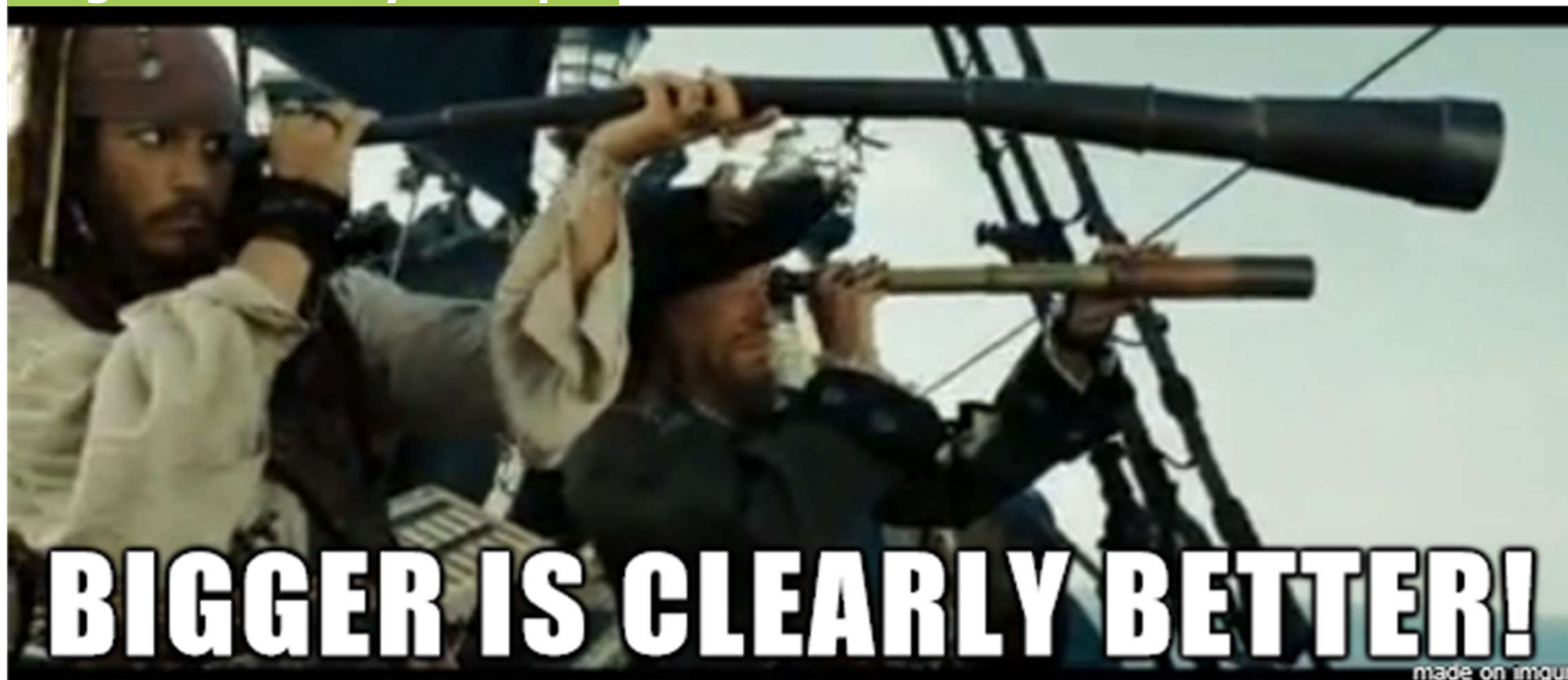
- Zielvolumen: oberes 1/3 des Vaginalstumpfs
- z.B. 3 x 7 Gy auf 5mm Gewebetiefe
- Beginn 4-6 Wochen postOP



## Durchführung Vaginale Brachytherapie



**Welche Applikatorgröße?  
Vaginale Brachytherapie**

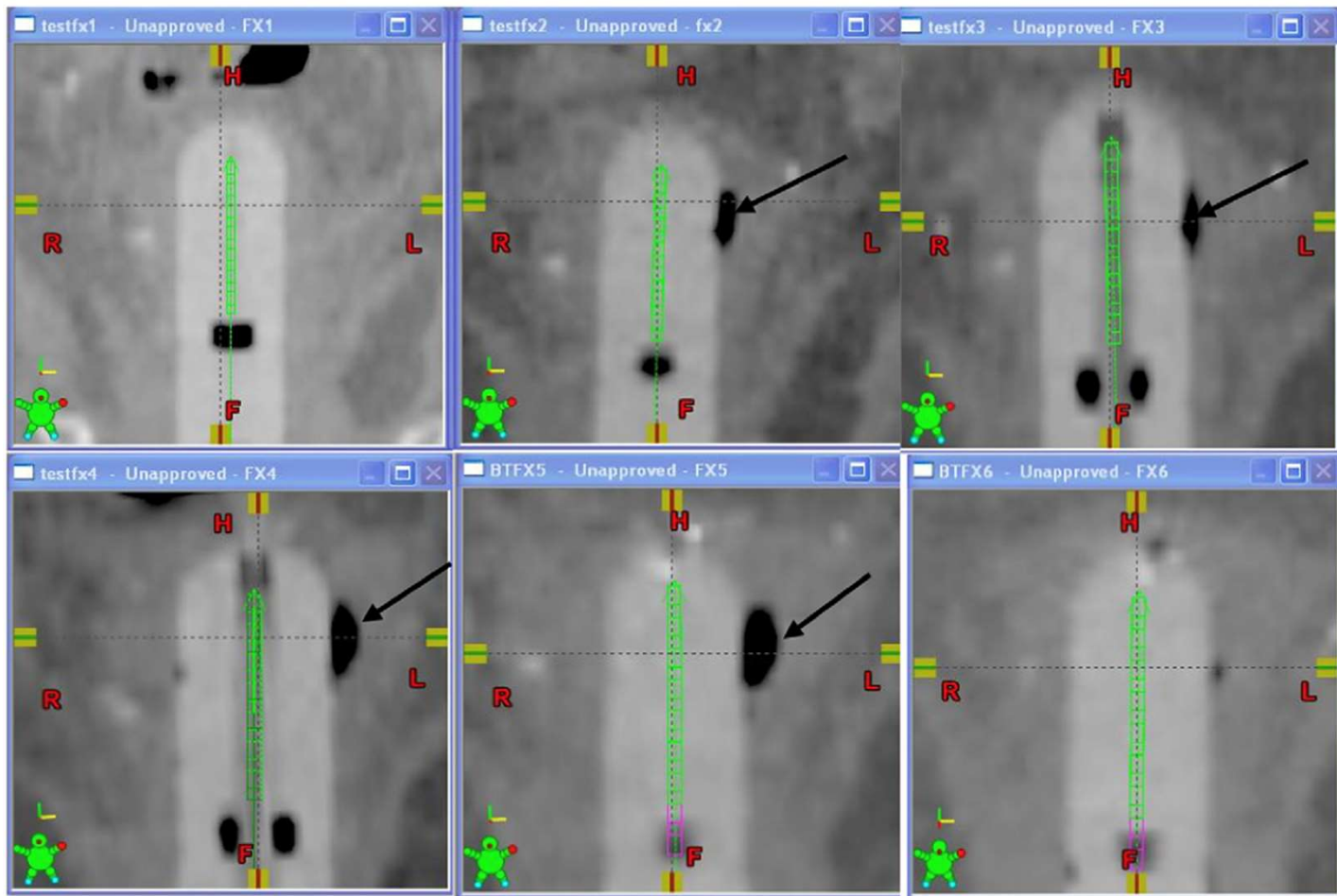


DOSIMETRIC EFFECTS OF AIR POCKETS AROUND HIGH-DOSE RATE  
BRACHYTHERAPY VAGINAL CYLINDERS

SUSAN RICHARDSON, PH.D., GEETHPRIYA PALANISWAAMY, PH.D., AND PERRY W. GRIGSBY, M.D.

Department of Radiation Oncology, Mallinckrodt Institute of Radiology, Washington University School of Medicine, St. Louis, MO

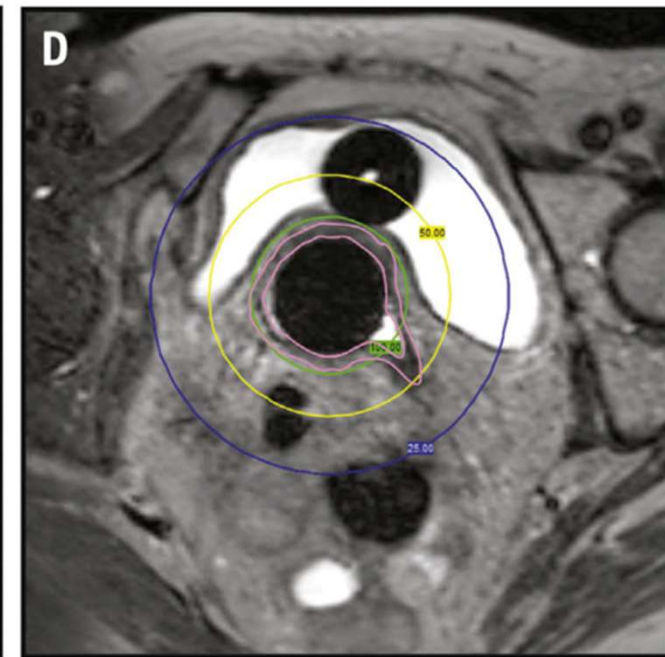
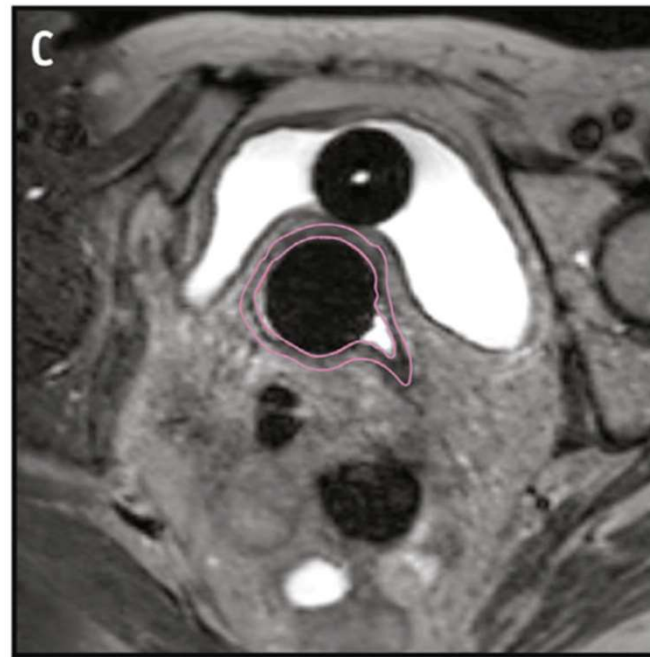
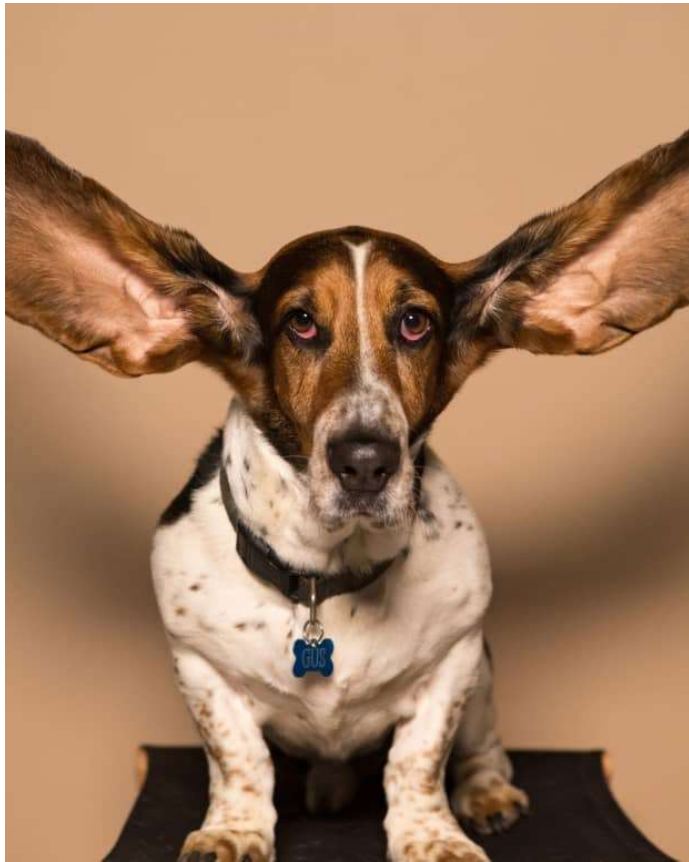
# Welche Applikatorgröße? Vaginale Brachytherapie



## Welche Applikatorgröße? Vaginale Brachytherapy

### MRI-Based Evaluation of the Vaginal Cuff in Brachytherapy Planning: Are We Missing the Target?

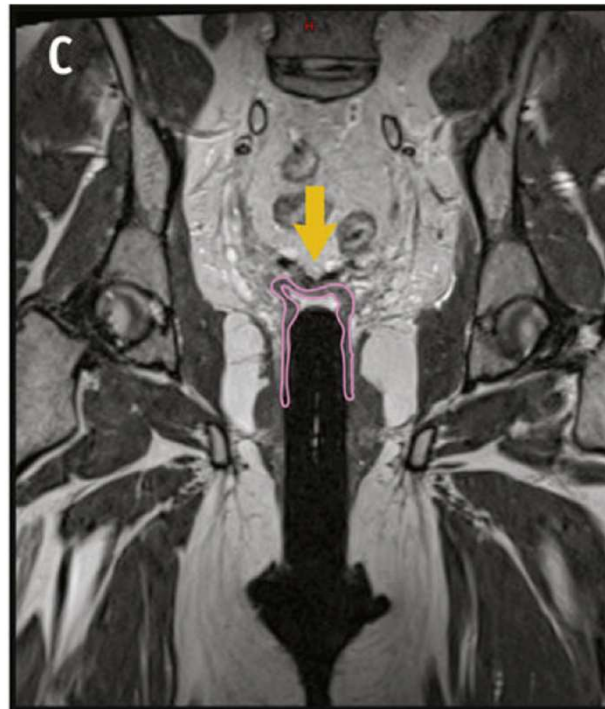
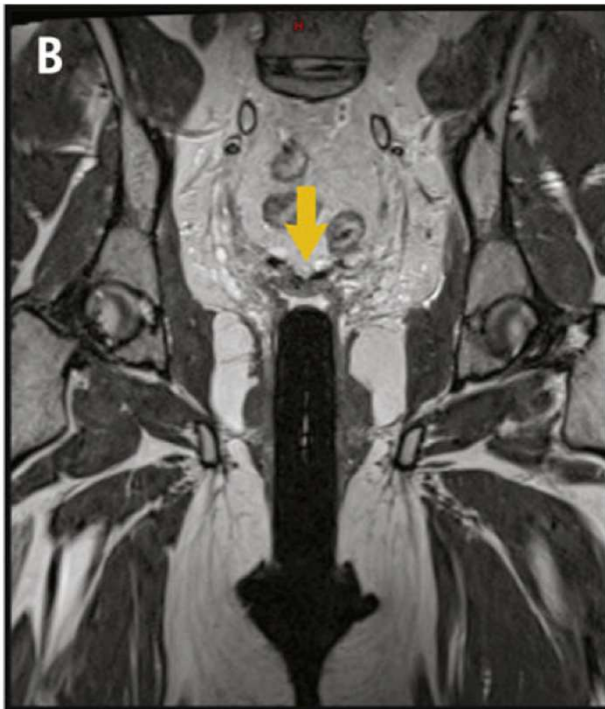
Christina Hunter Chapman, MD<sup>\*</sup>, Joann I. Prisciandaro, PhD<sup>\*</sup>, Katherine E. Maturen, MD<sup>†</sup>, Yue Cao, PhD<sup>\*†‡</sup>, James M. Balter, PhD<sup>\*‡</sup>, Karen McLean, MD, PhD<sup>§</sup>, and Shruti Jolly, MD<sup>\*</sup>



## Welche Applikatorgröße? Vaginale Brachytherapie

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- Dosisseinbrüche bis zu 50% !

# Welche Applikatorgröße? Vaginale Brachytherapie

The vaginal cylinder: Misunderstood, misused, or trivial? An in-depth dosimetric and multiinstitutional outcome investigation

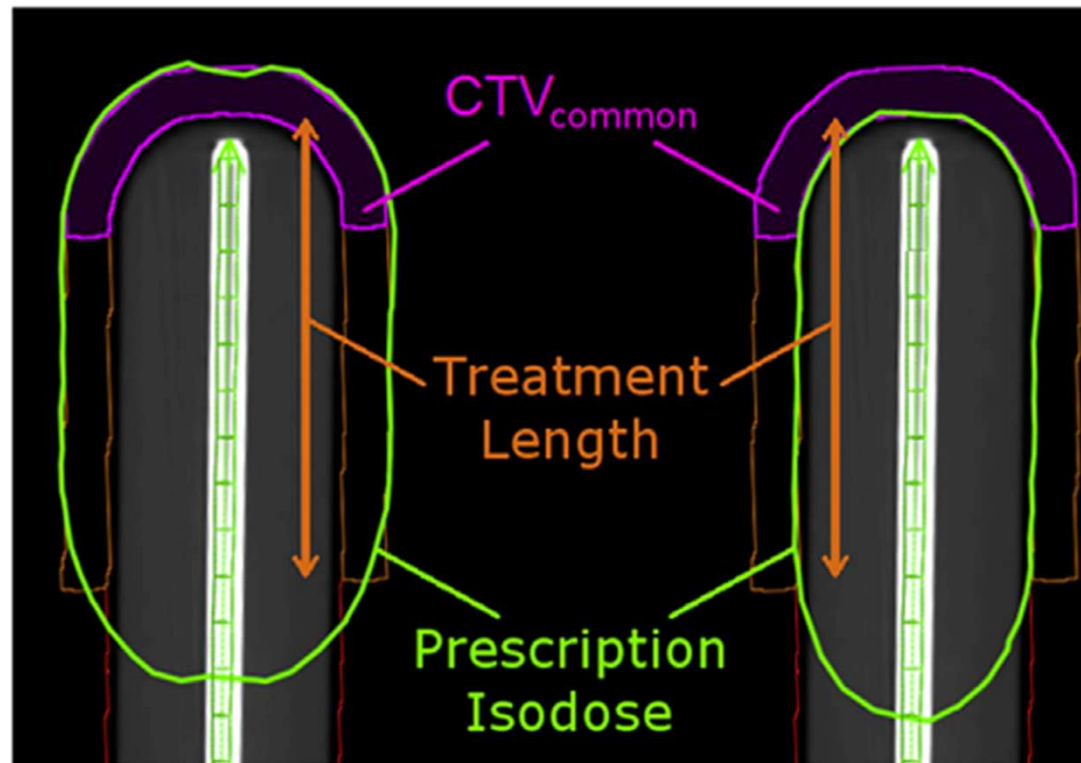
Christopher L. Guy<sup>1</sup>, Emma C. Fields<sup>1</sup>, Bridget A. Quinn<sup>1</sup>, Christine M. Fisher<sup>2</sup>, Colton J. Ladbury<sup>2</sup>, Kara D. Romano<sup>3</sup>, Dorin Todor<sup>1,\*</sup>

<sup>1</sup>Department of Radiation Oncology, Virginia Commonwealth University, Richmond, VA

<sup>2</sup>Department of Radiation Oncology, University of Colorado, Aurora, CO

<sup>3</sup>Department of Radiation Oncology, University of Virginia, Charlottesville, VA

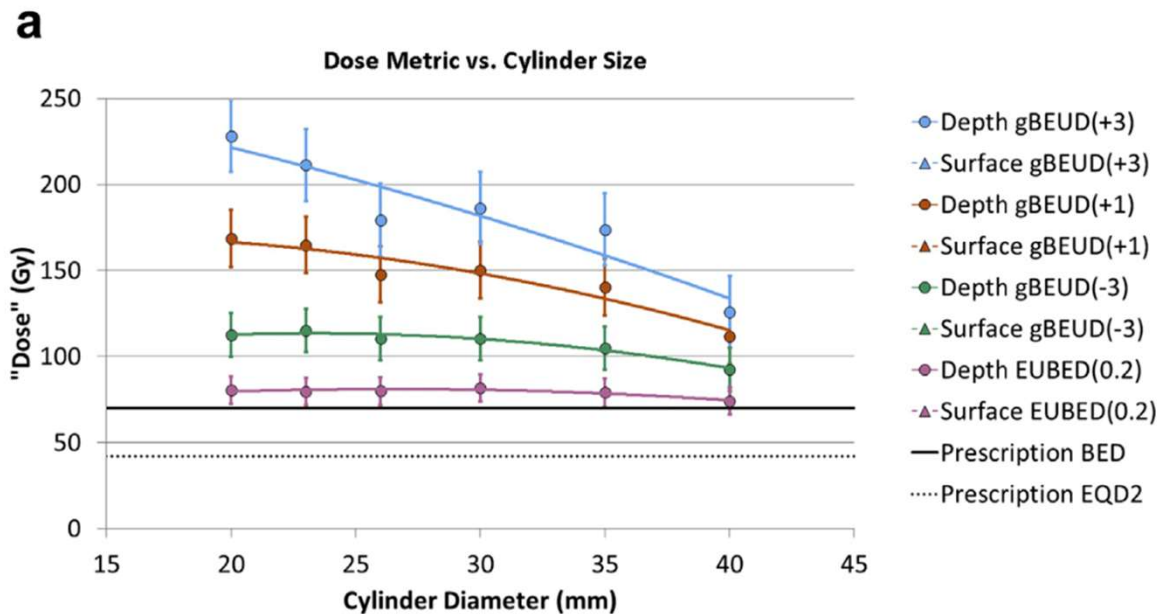
5mm Tiefe



Applikatoroberfläche

# Welche Applikatorgröße? Vaginale Brachytherapie

5mm Tiefe



The vaginal cylinder: Misunderstood, misused, or trivial? An in-depth dosimetric and multiinstitutional outcome investigation

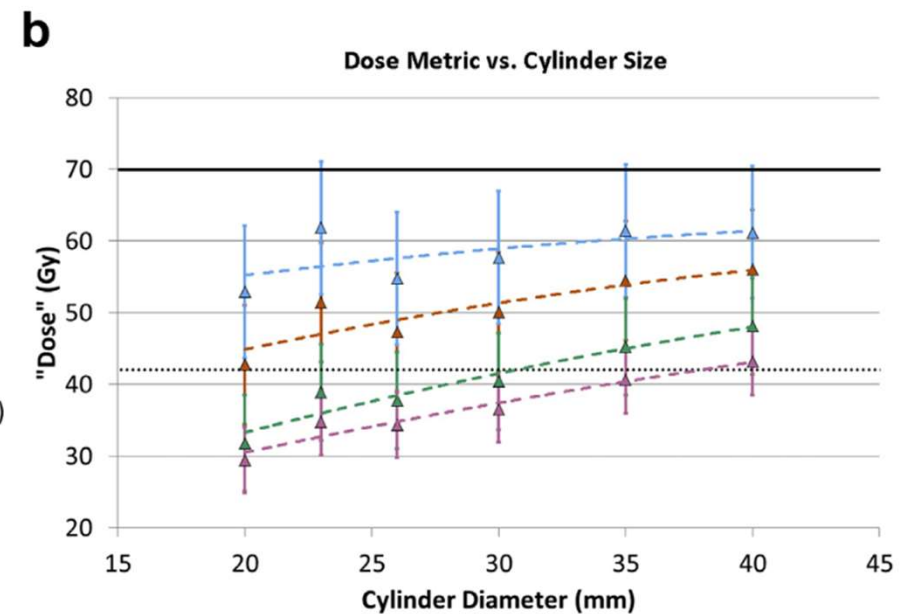
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<sup>1</sup>Department of Radiation Oncology, Virginia Commonwealth University, Richmond, VA

<sup>2</sup>Department of Radiation Oncology, University of Colorado, Aurora, CO

<sup>3</sup>Department of Radiation Oncology, University of Virginia, Charlottesville, VA

Applikatoroberfläche



## Welche Applikatorgröße? Vaginale Brachytherapie

### Impact of vaginal cylinder diameter on outcomes following brachytherapy for early stage endometrial cancer

Jack M. Qian<sup>1</sup>, John M. Stahl<sup>1</sup>, Melissa R. Young<sup>1</sup>, Elena Ratner<sup>2</sup>,  
Shari Damast<sup>1</sup>

- 300 Patientinnen, Toxizität: Vaginale Stenose

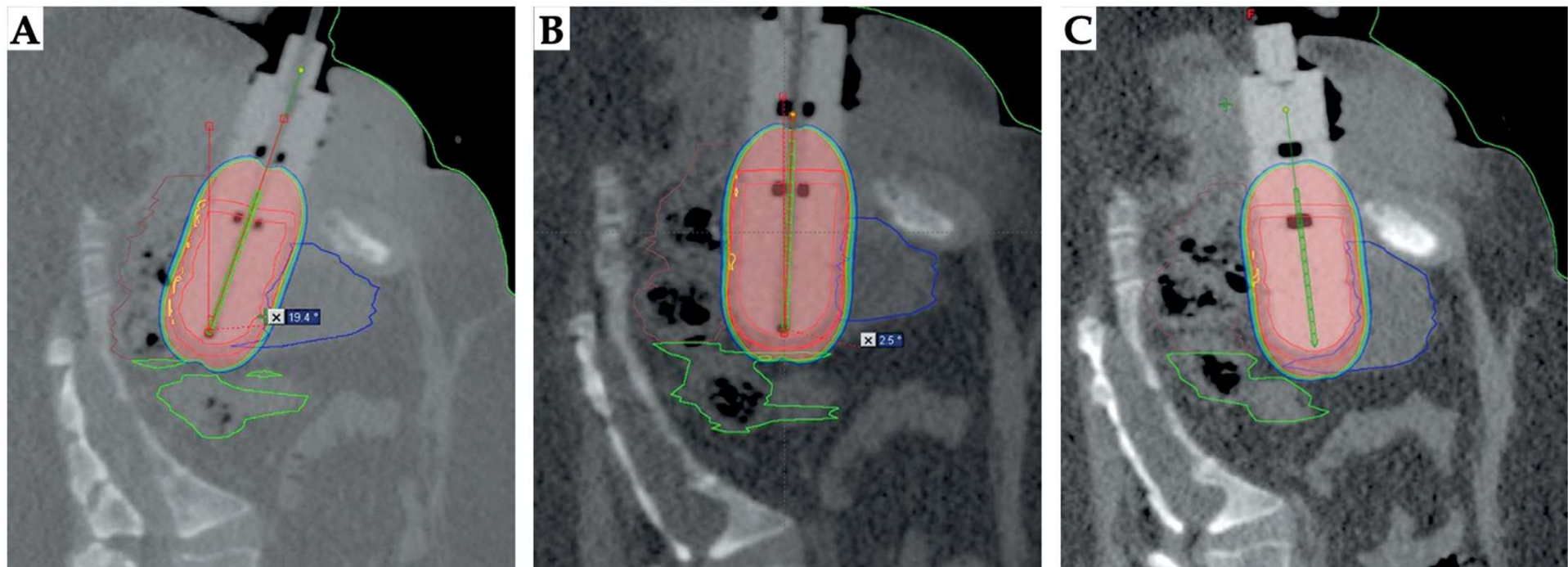
**Table 3.** Association of treatment characteristics including small cylinder size with vaginal stenosis: univariate and multivariate analyses

| Characteristics                 | No vaginal stenosis (n=93) | Grade ≥1 vaginal stenosis (n=51) | Unadjusted p-value | Adjusted p-value | OR         | 95% CI          |
|---------------------------------|----------------------------|----------------------------------|--------------------|------------------|------------|-----------------|
| Dilator compliance              |                            |                                  | 0.063              | 0.016            |            |                 |
| Yes                             | 69 (74.2)                  | 30 (58.8)                        |                    |                  | -          | -               |
| No                              | 24 (25.8)                  | 21 (41.2)                        |                    |                  | 2.7        | 1.2–6.1         |
| Sexually active                 |                            |                                  | 0.003              | 0.005            |            |                 |
| Yes                             | 40 (43.0)                  | 9 (17.6)                         |                    |                  | -          | -               |
| No                              | 53 (57.0)                  | 42 (82.4)                        |                    |                  | 3.6        | 1.5–8.9         |
| <b>Small cylinder size (cm)</b> |                            |                                  | <b>0.002</b>       | <b>0.007</b>     |            |                 |
| <b>2.0–2.3</b>                  | <b>7 (7.5)</b>             | <b>14 (27.5)</b>                 |                    |                  | <b>4.7</b> | <b>1.5–14.7</b> |
| <b>2.6–3.0</b>                  | <b>86 (92.5)</b>           | <b>37 (72.5)</b>                 |                    |                  | -          | -               |
| Gravidity                       |                            |                                  | 0.004              | 0.056            |            |                 |
| G0                              | 9 (9.7)                    | 15 (29.4)                        |                    |                  | 2.7        | 0.9–7.4         |
| ≥G1                             | 84 (90.3)                  | 36 (70.6)                        |                    |                  | -          | -               |

# Welche Position? Vaginale Brachytherapie

## Effects of vaginal cylinder position on dose distribution in patients with endometrial carcinoma in treatment of vaginal cuff brachytherapy

Yurday Ozdemir, MD, Yemliha Dolek, MSc, Cem Onal, MD  
Department of Radiation Oncology, Baskent University Faculty of Medicine, Adana, Turkey



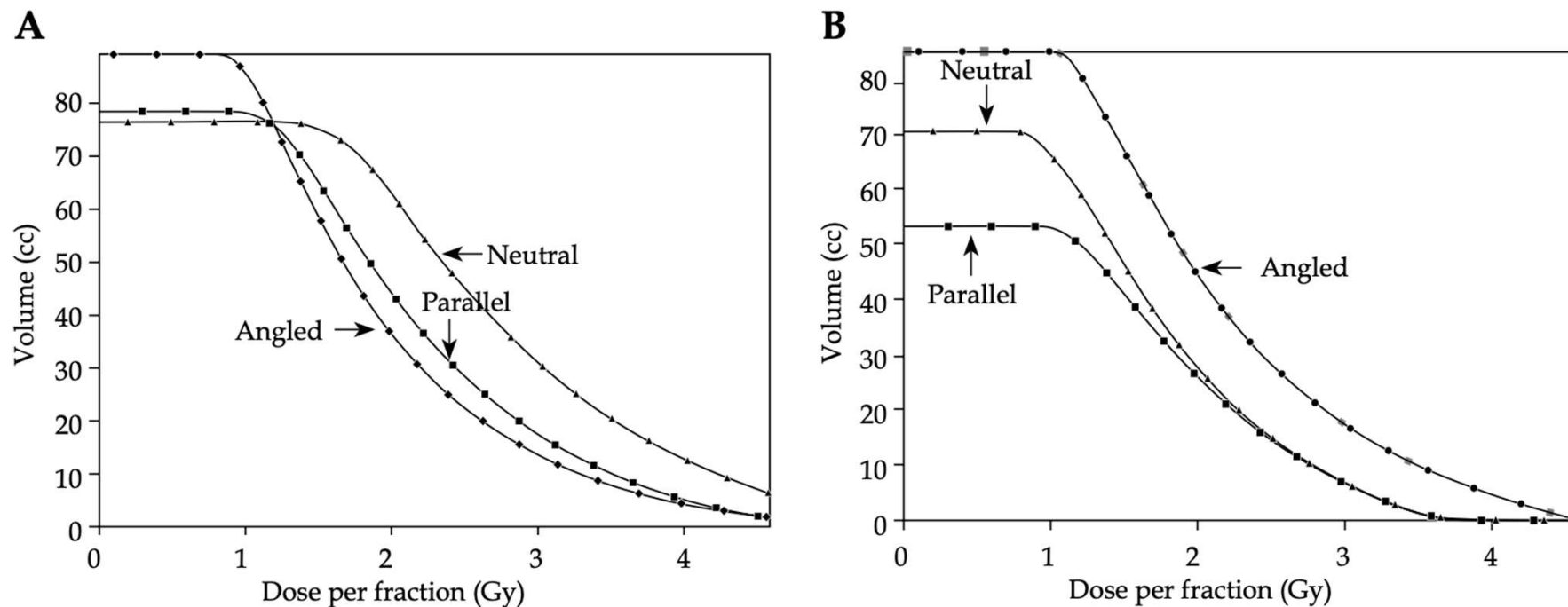
**Fig. 1.** The 4 Gy isodose area (red) according to the vaginal cylinder in the (A) neutral, (B) parallel, and (C) angled positions in a representative patient

# Welche Position?

## Vaginale Brachytherapie

### Effects of vaginal cylinder position on dose distribution in patients with endometrial carcinoma in treatment of vaginal cuff brachytherapy

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Department of Radiation Oncology, Baskent University Faculty of Medicine, Adana, Turkey



**Fig. 2.** Comparative dose-volume histogram of the (A) rectum and (B) bladder according to the vaginal cylinder in the neutral (triangle), parallel (square), and angled (sphere) positions

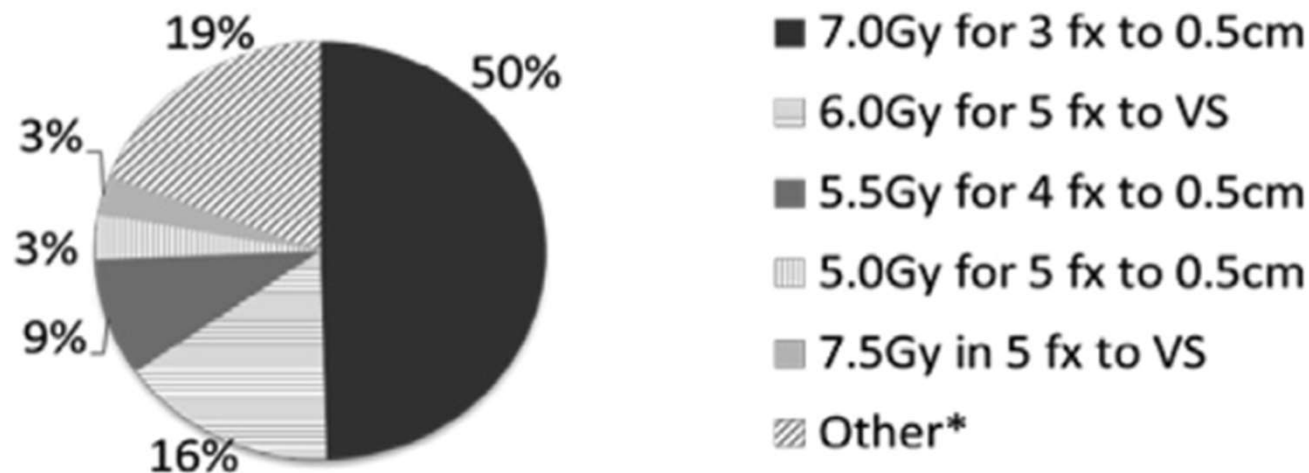
## Welche Dosis?

## Vaginale Brachytherapie

### Vaginal brachytherapy for postoperative endometrial cancer: 2014 Survey of the American Brachytherapy Society

Matthew M. Harkenrider<sup>1,\*</sup>, Surbhi Grover<sup>2</sup>, Beth A. Erickson<sup>3</sup>, Akila N. Viswanathan<sup>4</sup>,  
Christina Small<sup>5</sup>, Stephanie Kliethermes<sup>5</sup>, William Small Jr<sup>1</sup>

### 2014 Survey VBT Alone Doses



\* Dose-fractionation schedules with  $\geq 2$  responses in 2014 survey:

To VS - 10.5Gy for 3 fx, 8.0Gy for 3 fx, 4.0 Gy for 6 fx

To 0.5cm - 5.0Gy for 4 fx, 5.0Gy for 3 fx, 4.7Gy for 5 fx, 4.5Gy for 5 fx

## Welche Dosis?

## Vaginale Brachytherapie

Table 2

Vaginal cuff brachytherapy fractionation schedules after hysterectomy

| Prescription point                | Dose per fraction (Gy) | # Of fractions |
|-----------------------------------|------------------------|----------------|
| 0.5 cm depth from vaginal surface | 7 <sup>a</sup>         | 3              |
|                                   | 5.5 <sup>b</sup>       | 4              |
|                                   | 5 <sup>c</sup>         | 5              |
|                                   | 2.5 <sup>d</sup>       | 6              |
| Vaginal surface                   | 6 <sup>e</sup>         | 5              |
|                                   | 8.5 <sup>f</sup>       | 4              |
|                                   | 4 <sup>g</sup>         | 6              |

<sup>a</sup> Portec-2 (30).<sup>b</sup> ABS survey, also equivalent to f (3,31).<sup>c</sup> Michigan series (32).<sup>d</sup> Sorbe *et al.* (29).<sup>e</sup> MDAC series.<sup>f</sup> Australian series (33).<sup>g</sup> DFCI series (34).

## Welche Dosis?

## Vaginale Brachytherapie

- Dosis an Applikatoroberfläche (3cm)

Table 3

Vaginal cuff brachytherapy schedules with corresponding surface doses for a 3 cm diameter cylinder

| 3 cm Cylinder dose | Prescription depth | Surface EQD <sub>2</sub> <sub>10</sub><br>per fx (Gy) | Total surface<br>EQD <sub>2</sub> <sub>10</sub> (Gy) | 5 mm depth EQD <sub>2</sub> <sub>10</sub><br>per fx (Gy) | Total 5 mm depth<br>EQD <sub>2</sub> <sub>10</sub> (Gy) |
|--------------------|--------------------|-------------------------------------------------------|------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------|
| 7Gy × 3            | 5 mm               | 19.25                                                 | 57.75                                                | 9.92                                                     | 29.75                                                   |
| 5.5 Gy × 4         | 5 mm               | 13.56                                                 | 54.23                                                | 7.1                                                      | 28.42                                                   |
| 7.5 Gy × 5         | Surface            | 10.94                                                 | 54.69                                                | 5.92                                                     | 29.6                                                    |
| 5Gy × 5            | 5 mm               | 11.78                                                 | 58.92                                                | 6.25                                                     | 31.25                                                   |
| 6Gy × 5            | Surface            | 8                                                     | 40                                                   | 4.52                                                     | 22.59                                                   |
| 2.5 Gy × 6         | 5 mm               | 4.67                                                  | 28                                                   | 2.6                                                      | 15.62                                                   |

EQD2 = normalized therapy dose.

## Indikation

### Definitive Brachytherapie

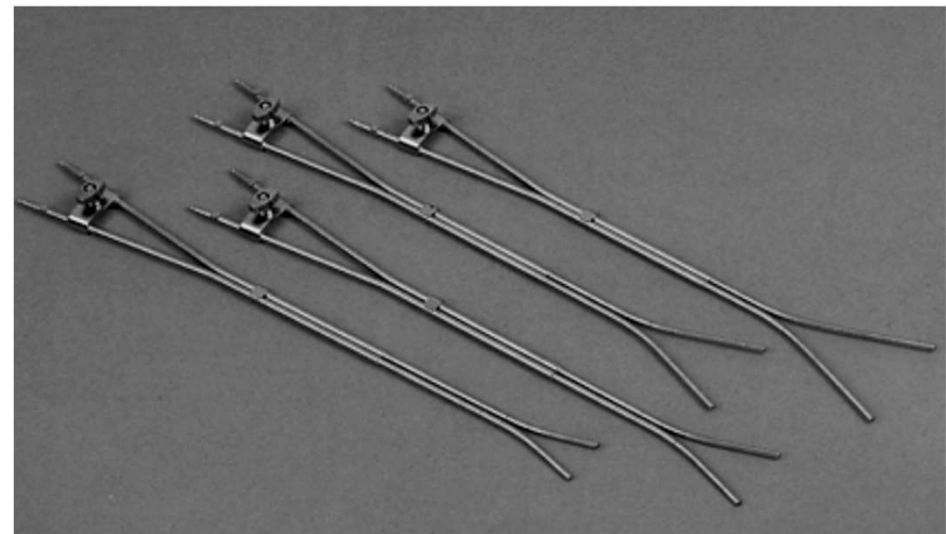
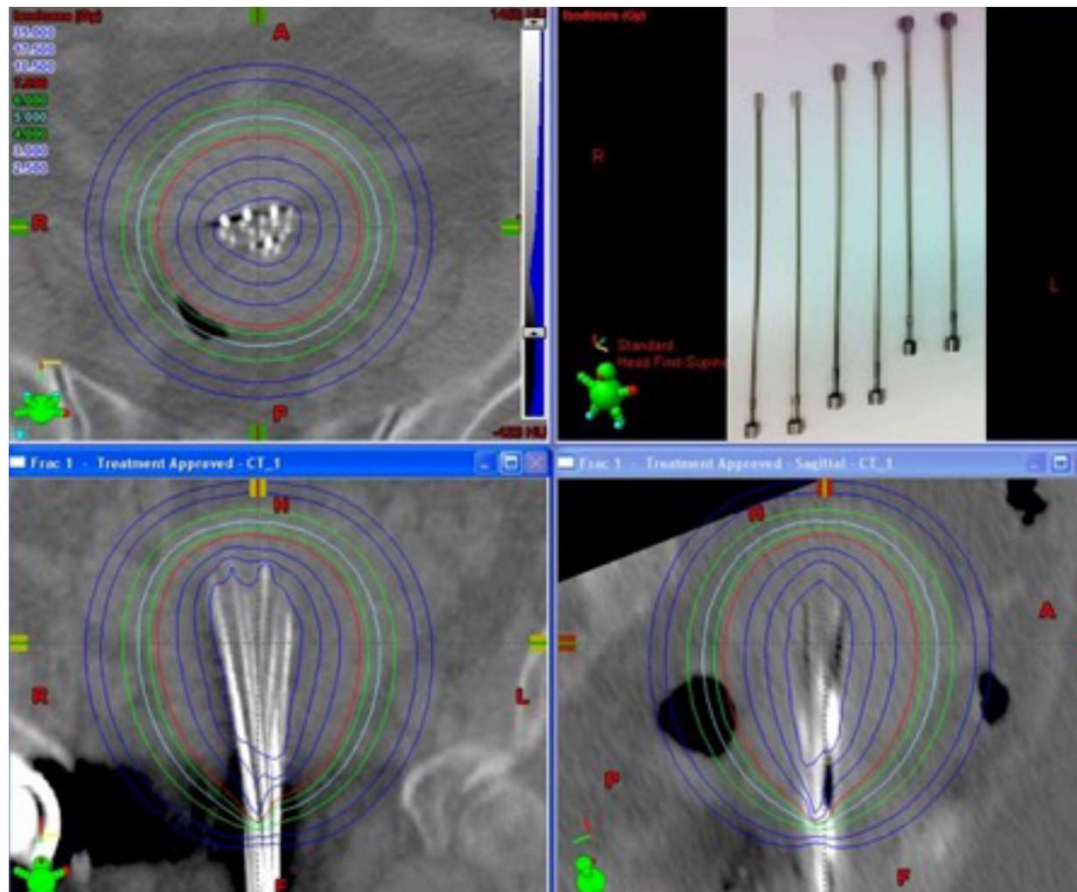
#### ■ Bei Inoperabilität:

- **Alleinige Brachytherapie:** bei niedriggradigen Stadium I Tumoren
- **EBRT und Brachytherapie:** bei hochgradigen Stadium I Tumoren und/oder tiefer myometraner Invasion (>FIGO 1b)



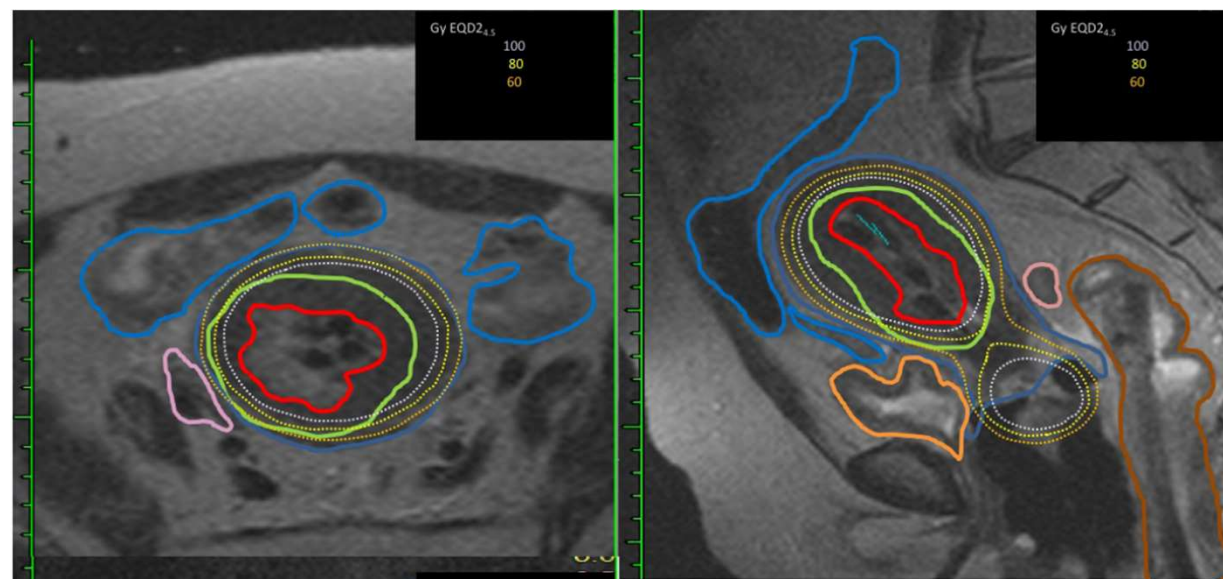
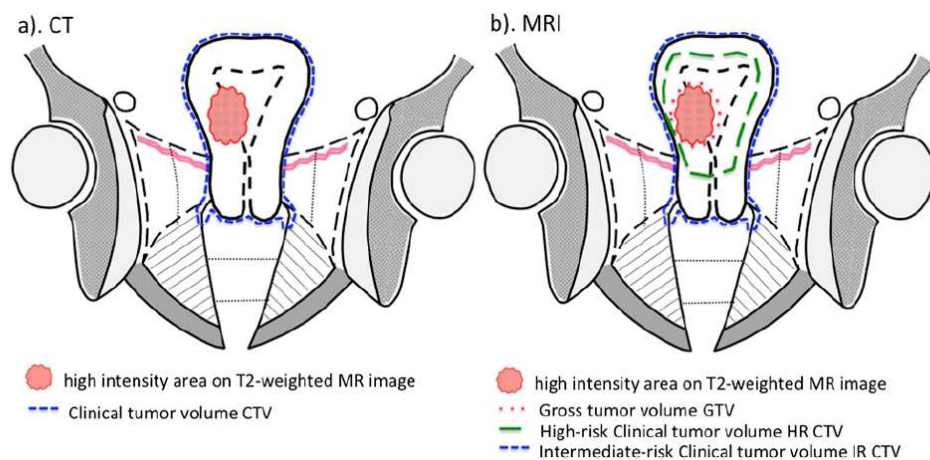
## Indikation

## Definitive Brachytherapie



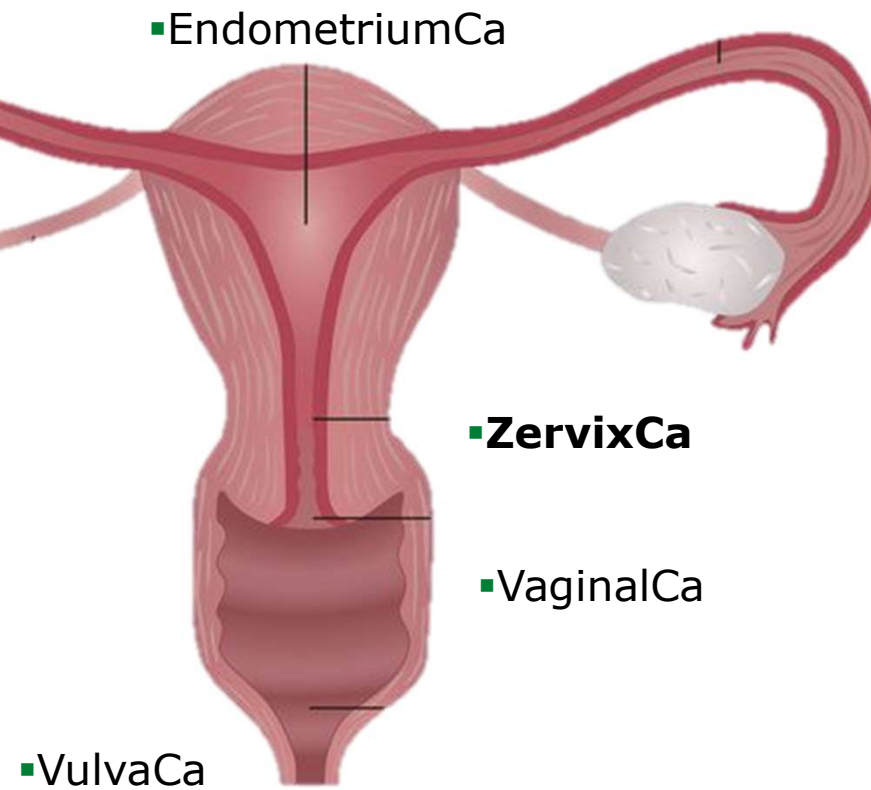
# Indikation

## Definitive Brachytherapie



# Gynäkologische Tumore

## Agenda

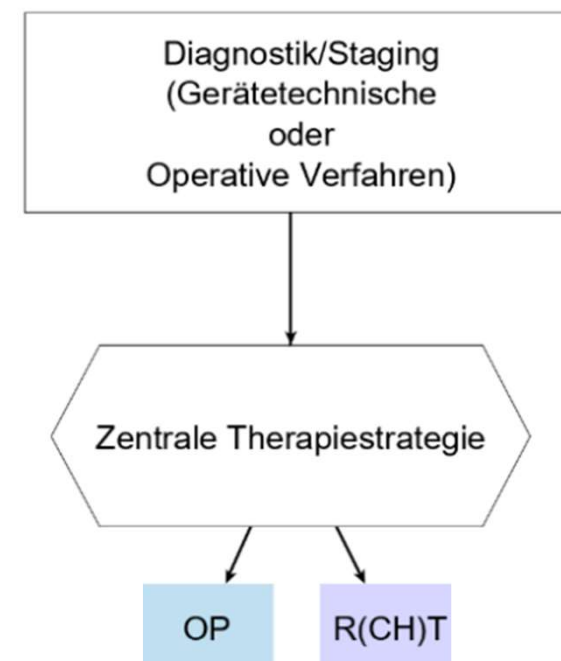


## Zervixkarzinom

### Definitive Radiochemotherapie



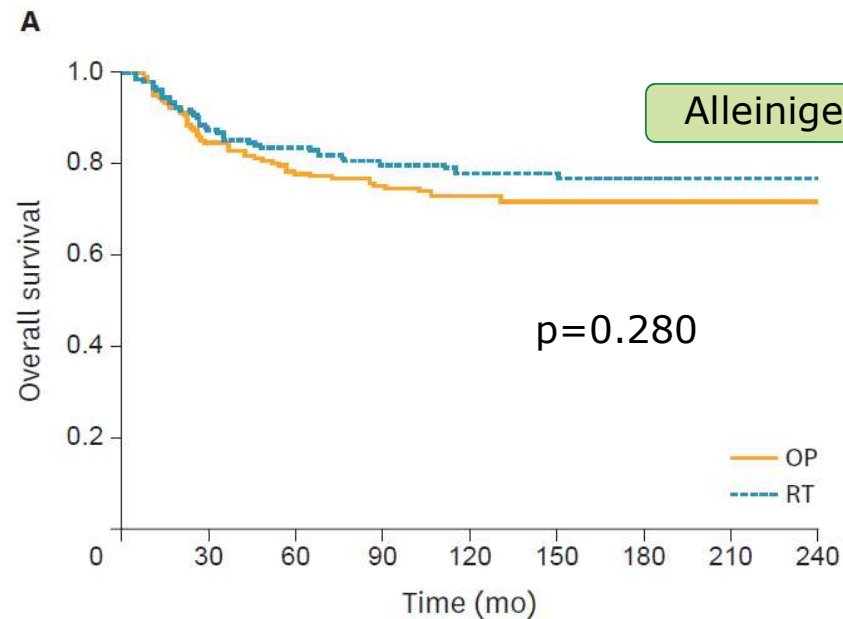
### Unimodales Therapiekonzept!



# Zervixkarzinom

## Primäre Radiotherapie

- **Randomisierte** Studie – 20 Jahre FU
- 343 Patienten



Randomized study between radical surgery and radiotherapy for the treatment of stage IB–IIA cervical cancer: 20-year update

Fabio Landoni,<sup>1</sup> Alessandro Colombo,<sup>2</sup> Rodolfo Milani,<sup>2</sup> Franco Placa,<sup>2</sup> Vanna Zanagnolo,<sup>1</sup> Costantino Mangioni<sup>3</sup>

<sup>1</sup>Division of Gynecology, European Institute of Oncology, Milan, Italy

<sup>2</sup>Division of Radiotherapy, Hospital of Lecco, Lecco, Italy

<sup>3</sup>Obstetrics and Gynecology Clinic, University of Milan-Bicocca, Monza, Italy

## Articles

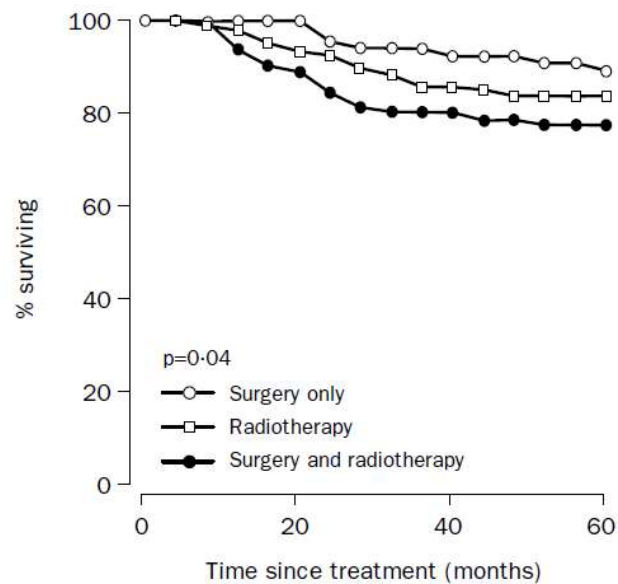
## Randomised study of radical surgery versus radiotherapy for stage Ib-IIa cervical cancer

Fabio Landoni, Andrea Maneo, Alessandro Colombo, Franco Placa, Rodolfo Milani, Patrizia Perego, Giorgio Favini, Luigi Ferri, Costantino Mangioni

# Zervixkarzinom

## Primäre Radiotherapie

- Bei Risikofaktoren → adjuvante Radiotherapie
  - >pT2a
  - Tiefe Stromainvasion
  - N+



64% im OP Arm  
haben adj. RT  
erhalten!

# Zervixkarzinom

## Primäre Radiotherapie

Randomized study between radical surgery and radiotherapy for the treatment of stage IB–IIA cervical cancer: 20-year update

Fabio Landoni,<sup>1</sup> Alessandro Colombo,<sup>2</sup> Rodolfo Milani,<sup>2</sup> Franco Placa,<sup>2</sup> Vanna Zanagnolo,<sup>1</sup> Costantino Mangioni<sup>3</sup>

<sup>1</sup>Division of Gynecology, European Institute of Oncology, Milan, Italy  
<sup>2</sup>Division of Radiotherapy, Hospital of Lecco, Lecco, Italy  
<sup>3</sup>Obstetrics and Gynecology Clinic, University of Milan-Bicocca, Monza, Italy

**Table 5.** Complications related to the actual treatment

| Type of complication   | Surgery          | Surgery+RT       | RT               |
|------------------------|------------------|------------------|------------------|
| No. of patients        | 61               | 108              | 158              |
| <b>Urologic</b>        |                  |                  |                  |
| Hydroureteronephrosis* | 2 (3.3)          | 11 (10.1)        | 9 (5.6)          |
| Ureteral fistula       | 1 (1.6)          | -                | -                |
| Urinary incontinence   | 2 (3.3)          | 4 (3.7)          | -                |
| Atonic bladder         | 8 (13.1)         | 5 (4.6)          | 1 (0.6)          |
| Actinic cystitis       | -                | 7 (6.4)          | 9 (5.6)          |
| <b>Vascular</b>        |                  |                  |                  |
| Pulmonary embolism     | 2 (3.3)          | 1 (0.9)          | -                |
| Legs edema             | -                | 12 (11.1)        | 1 (0.6)          |
| Lymphocyst             | 5 (8.2)          | 5 (4.6)          | 1 (0.6)          |
| Vascular lesion        | 1 (1.6)          | -                | -                |
| <b>Intestinal</b>      |                  |                  |                  |
| Rectal fistula         | -                | -                | 1 (0.6)          |
| Bowel obstruction      | -                | 6 (5.5)          | 2 (1.2)          |
| Proctitis              | -                | -                | 14 (8.8)         |
| <b>Others</b>          |                  |                  |                  |
| Wound abscess          | -                | -                | -                |
| Abdominal hernia       | 4 (6.6)          | 4 (3.7)          | 2 (1.2)          |
| Bone necrosis          | -                | 1 (0.9)          | -                |
| Vaginal necrosis       | -                | -                | 1 (0.6)          |
| Vaginal stenosis       | -                | 1 (0.9)          | 2 (1.2)          |
| Pelvic fibrosis        | -                | 4 (3.7)          | 3 (1.8)          |
| Uterine perforation    | -                | -                | 1 (0.6)          |
| Peritonitis            | -                | 1 (0.9)          | -                |
| <b>Total</b>           | <b>25 (40.7)</b> | <b>62 (56.4)</b> | <b>47 (29.0)</b> |

Values are presented as number of patients (%).

RT, radiotherapy.

\*Patients requiring ureteral stent or pyelostomy: 2 in surgery arm, 2 in surgery plus RT, 6 in RT arm. The sum of the complications exceeds the total number of complications because some of the patients had multiple morbidity.

Höchste  
Toxizität bei  
OP + adj. RT!

# Zervixkarzinom

## Brachytherapie

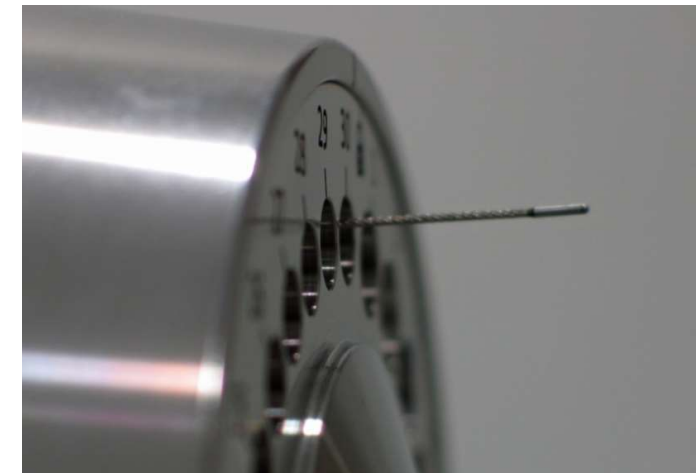
### S3-Leitlinie Diagnostik, Therapie und Nachsorge der Patientin mit Zervixkarzinom

Langversion 2.2 – März 2022  
AWMF-Registernummer: 032/033OL

#### 10.1.2. Technik der Brachytherapie in der primären kombinierten Radio(chemo)therapie

| 10.2.                         | Leitlinienadaptierte Empfehlung                                                                                                                                  | Geprüft 2021 |
|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| Empfehlungsgrad<br><b>B</b>   | Die Brachytherapie sollte Bestandteil des kurativen Therapiekonzeptes in der Primärtherapie des Zervixkarzinoms, die eine Radio(chemo)therapie beinhaltet, sein. |              |
| Level of Evidence<br><b>4</b> | Leitlinienadaptation: [85]                                                                                                                                       |              |
|                               | Starker Konsens                                                                                                                                                  |              |

| 10.3.     | Konsensbasierte Empfehlung                                                                                                                                                                        | Modifiziert 2021 |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| <b>EK</b> | In der primären Radiochemotherapie des Zervixkarzinoms sollte die Brachytherapie eingesetzt werden, um die Rate und den Schweregrad gastrointestinaler und urogenitaler Toxizitäten zu reduzieren | MRT-geplante     |
|           | Starker Konsens                                                                                                                                                                                   |                  |



# Zervixkarzinom

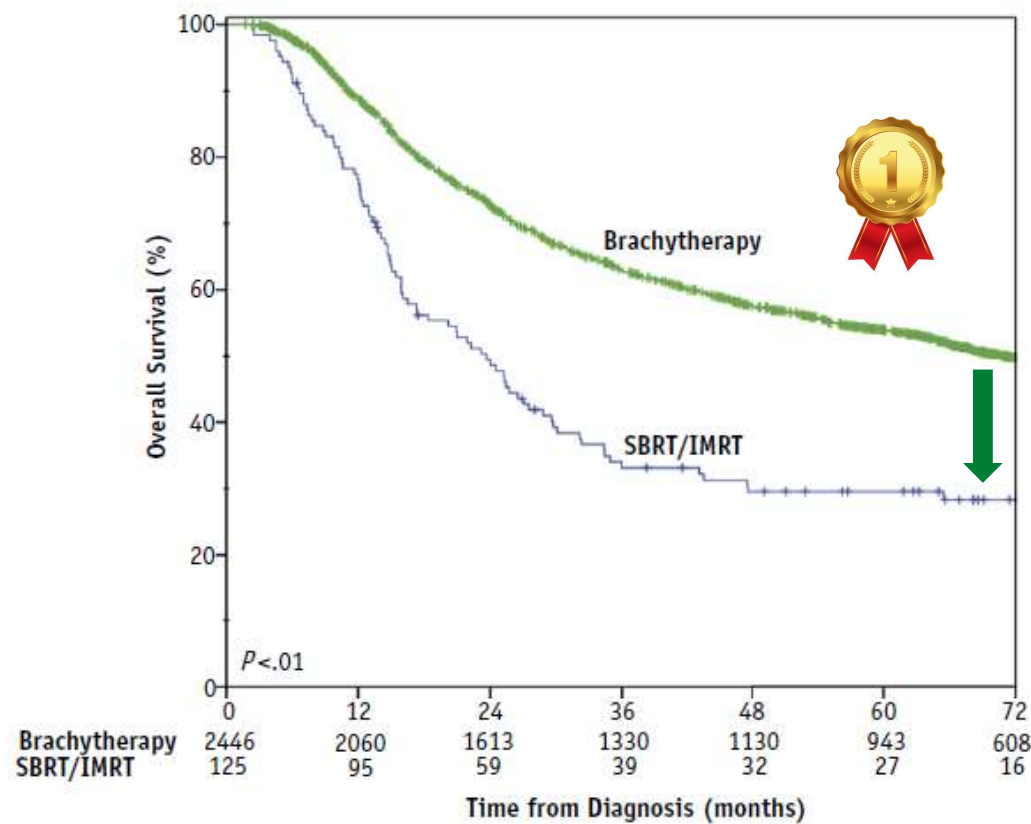
## Kann man BT ersetzen?

### National Cancer Data Base Analysis of Radiation Therapy Consolidation Modality for Cervical Cancer: The Impact of New Technological Advancements

Beant S. Gill, MD,\* Jeff F. Lin, MD,<sup>†</sup> Thomas C. Krivak, MD,<sup>‡</sup> Paniti Sukumvanich, MD,<sup>†</sup> Robin A. Laskey, MD,<sup>†</sup> Malcolm S. Ross, MD,<sup>†</sup> Jamie L. Lesnock, MD,<sup>†</sup> and Sushil Beriwal, MD\*

Departments of \*Radiation Oncology and <sup>†</sup>Gynecologic Oncology, Magee-Womens Hospital of University of Pittsburgh Medical Center, Pittsburgh, Pennsylvania; and <sup>‡</sup>Department of Gynecologic Oncology, Western Pennsylvania Hospital, Pittsburgh, Pennsylvania

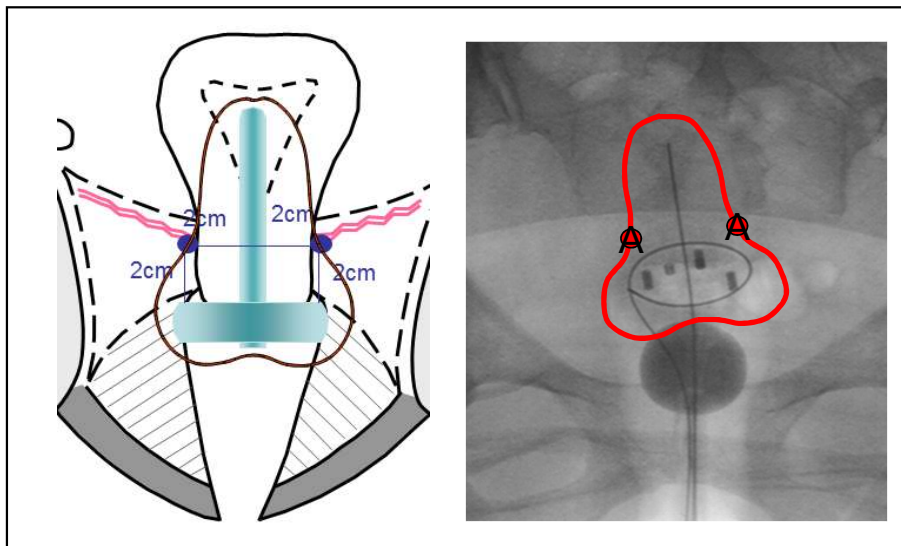
Received Feb 8, 2014, and in revised form Jun 27, 2014. Accepted for publication Jul 11, 2014.



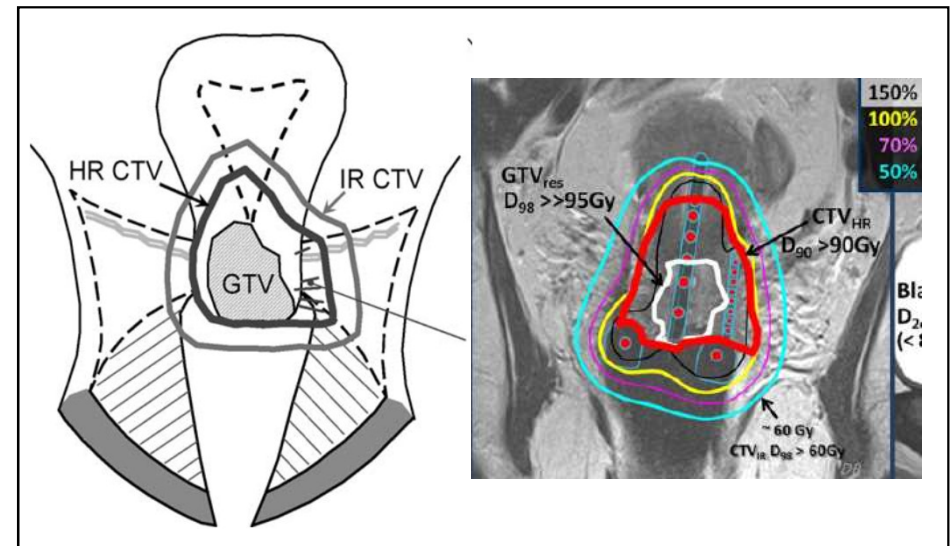
Brachytherapie ist und bleibt die Therapie der Wahl!

# Von der 2D zur MRT-bildgesteuerten adaptiven Brachytherapie

Röntgenbasierte- / Punkt-A basierte BT



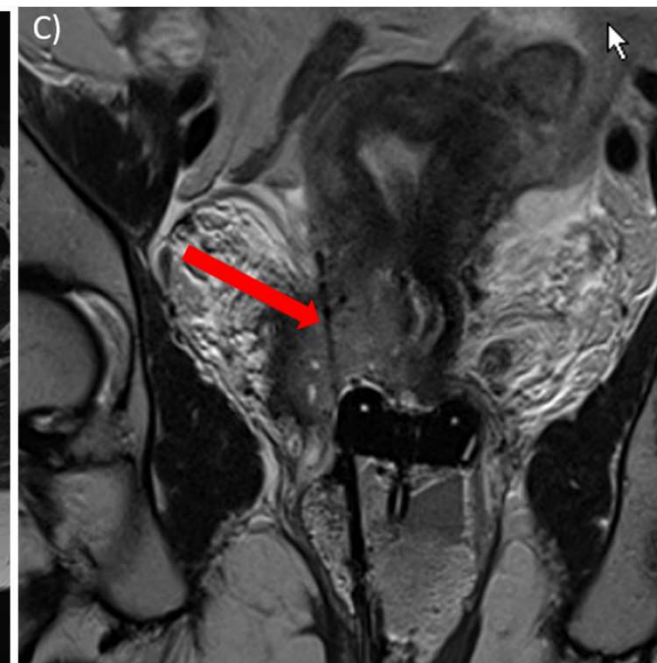
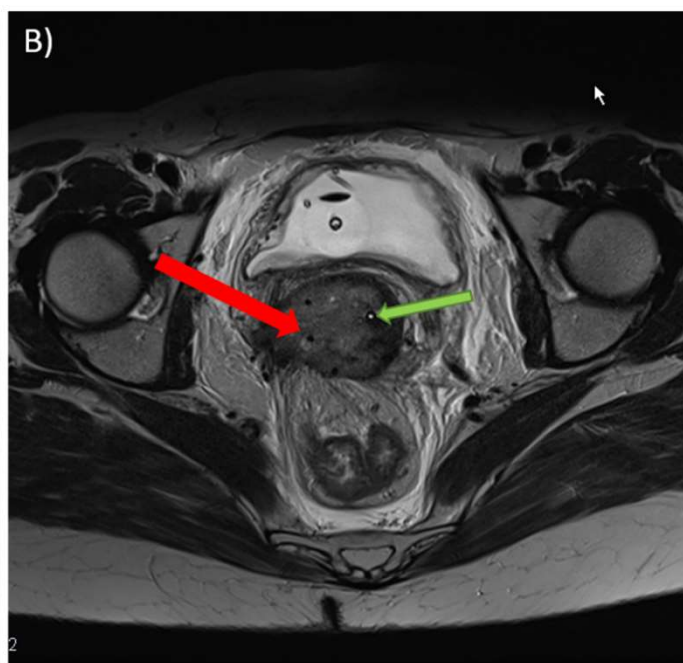
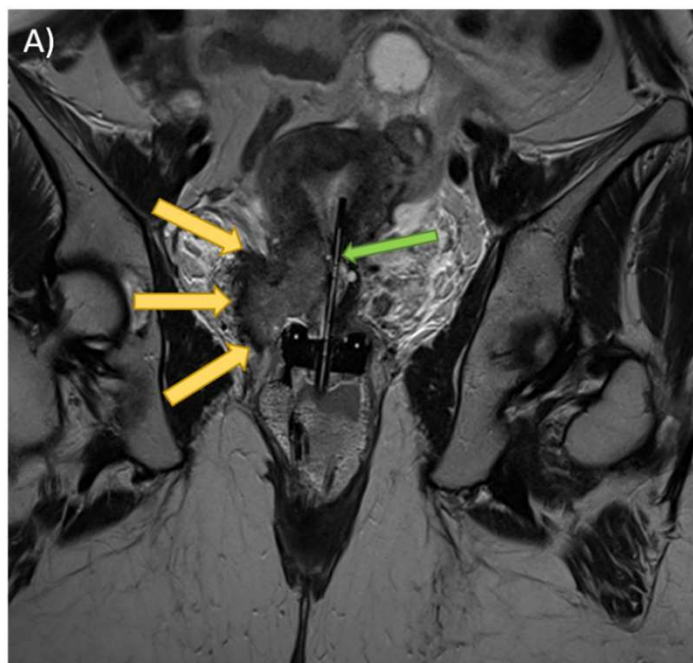
MRT / Volumen basierte adaptive BT



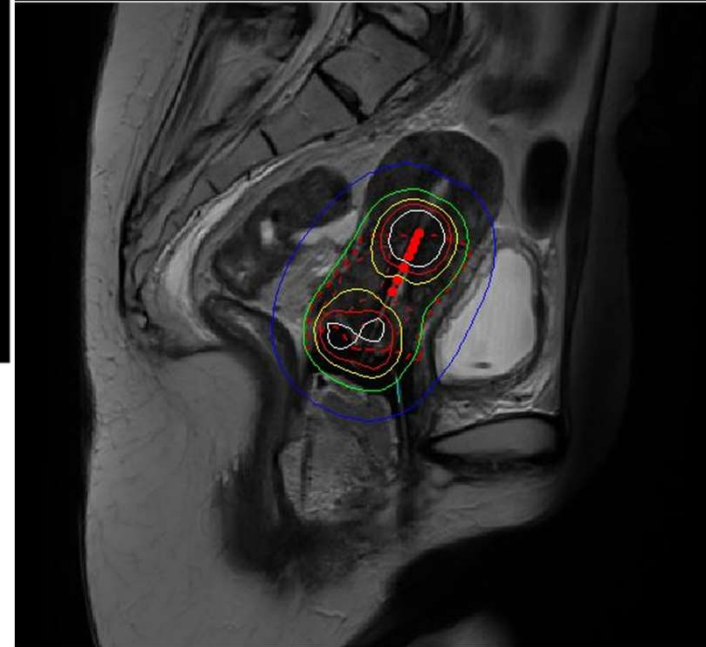
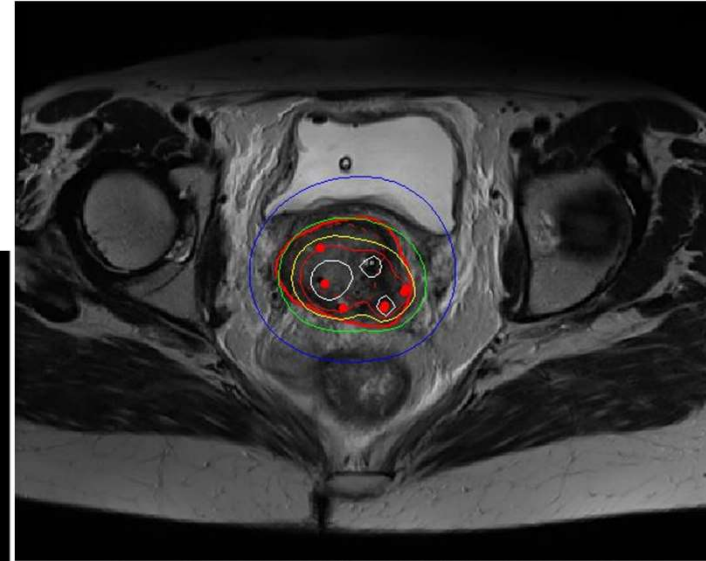
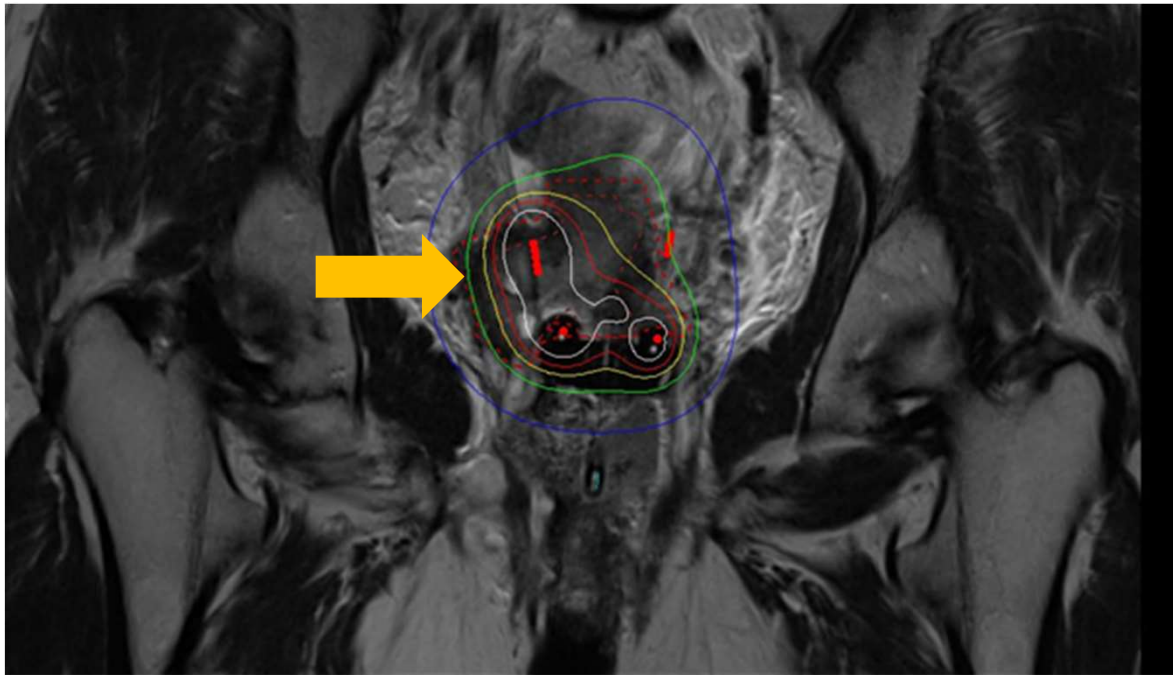
Courtesy of M. Schmidt (Uni Wien)

# Zervixkarzinom

## Intracavitär/Interstitielle Brachytherapie



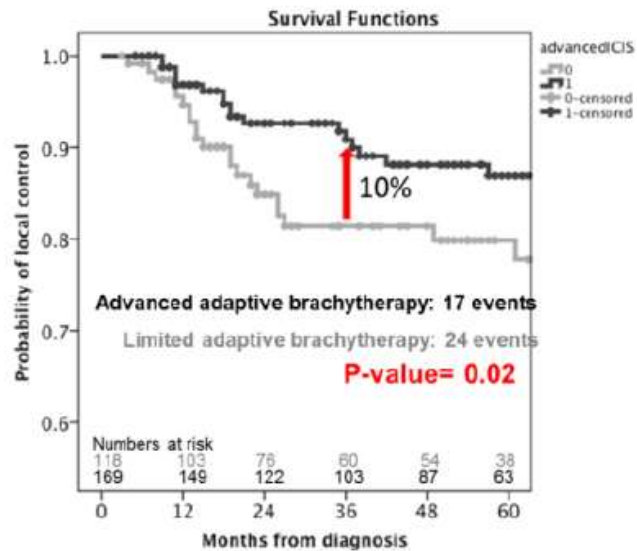
# Bestrahlungsplanung



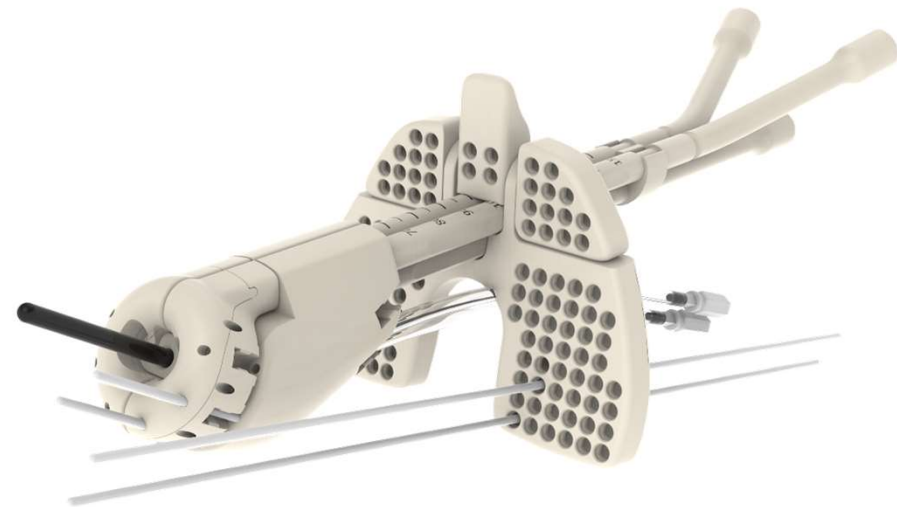
# Zervixkarzinom

## Intracavitär/Interstitielle Brachytherapie

CTVHR  $\geq 30 \text{ cm}^3$



RetroEMBRACE



Hybrid Applikatoren für  
kombinierte  
intracavitäre/interstitielle  
Brachytherapie

# Combined intracavitary and interstitial brachytherapy of cervical cancer using the novel hybrid applicator Venezia: Clinical feasibility and initial results

Franziska Walter<sup>1</sup>, Cornelius Maihöfer<sup>1</sup>, Lars Schüttrumpf<sup>1</sup>, Justus Well<sup>1</sup>, Alexander Burges<sup>2</sup>, Birgit Ertl-Wagner<sup>3</sup>, Sven Mahner<sup>2</sup>, Claus Belka<sup>1</sup>, Julia Gallwas<sup>2</sup>, Stefanie Corradini<sup>1,\*</sup>

<sup>1</sup>Department of Radiation Oncology, University Hospital, LMU Munich, Marchioninistr. 15, 81377 Munich, Germany

<sup>2</sup>Department of Obstetrics and Gynecology, University Hospital, LMU Munich, Marchioninistr. 15, 81377 Munich, Germany

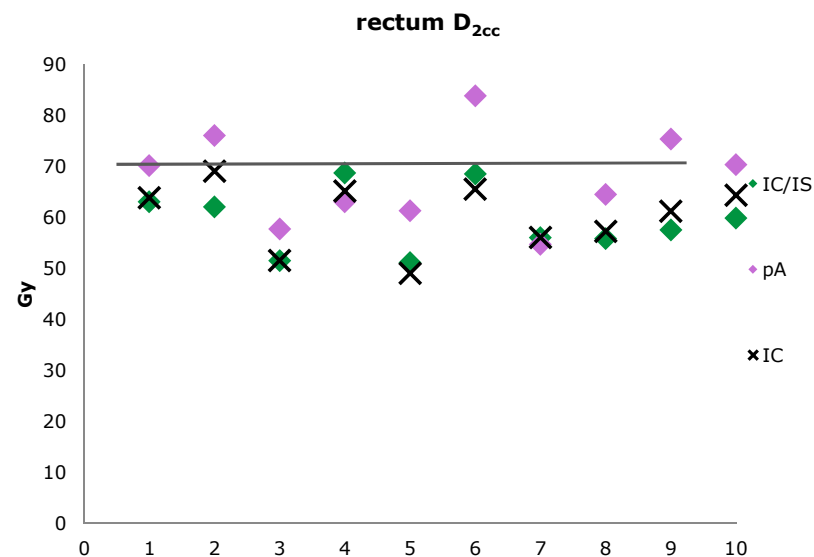
<sup>3</sup>Department of Radiology, University Hospital, LMU Munich, Marchioninistr. 15, 81377 Munich, Germany

## Zervixkarzinom

## Intracavitär/Interstitielle Brachytherapie

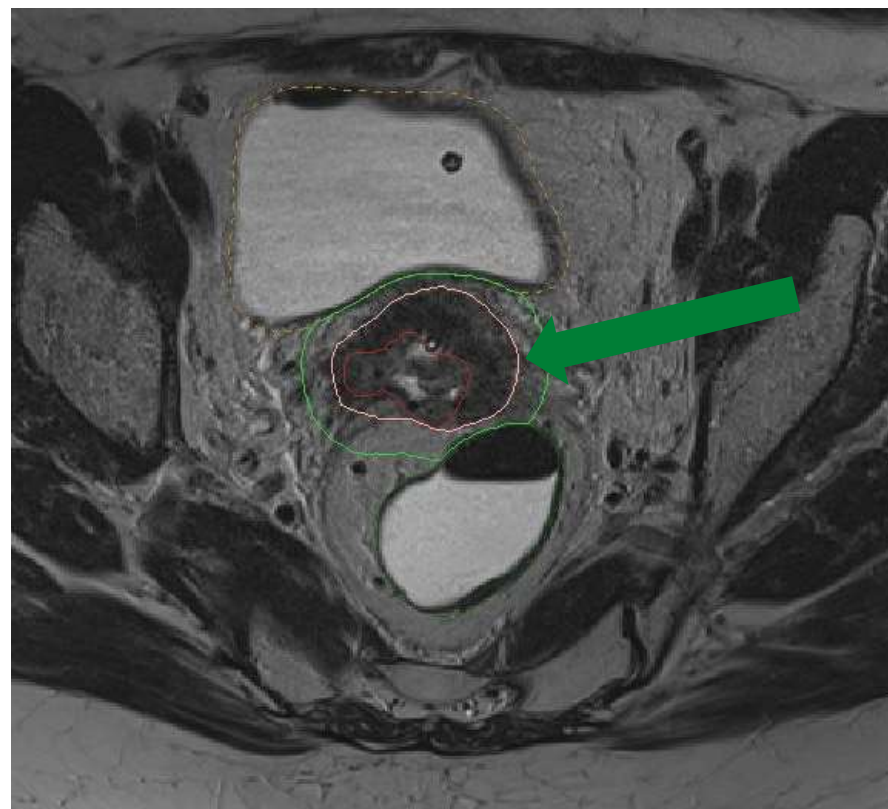
### ■ Dosisreduktion in Risikoorganen

- Blase
- Rektum
- Darm



## Zervixkarzinom

Warum ist das MRT wichtig?



# Limitationen zur Umstellung auf MRT-basierte Planung

## Zervix Brachy

- Keine MRT-basierte Planung:
  - Nicht MRT-kompatible Applikatoren
  - Weite Wege bis zur Radiologie
  - Feste MRT-slots
  - Umlagerung des Patienten



# Brachytherapie

## Workflow Organisation

Besprechung wichtiger Punkte im Vorfeld:

- Workflow Ablauf
- Welche Ressourcen sind verfügbar?
- Wie soll es umgesetzt werden?
- Verantwortlichkeiten?



# MRT-geplante Brachytherapie

## Interdisziplinär



- Radiologie
- Gynäkologie
- Anästhesie

## Workflow

### Zervix Brachytherapie

#### Vor Therapie

- Initiale Bildgebung (MRT, PET-CT)

#### Perkutane Therapie

- Perkutane RCHX mit Cisplatin weekly 40mg/qm
- In der letzten Woche MRT zur BT Planung (Pre-planning)

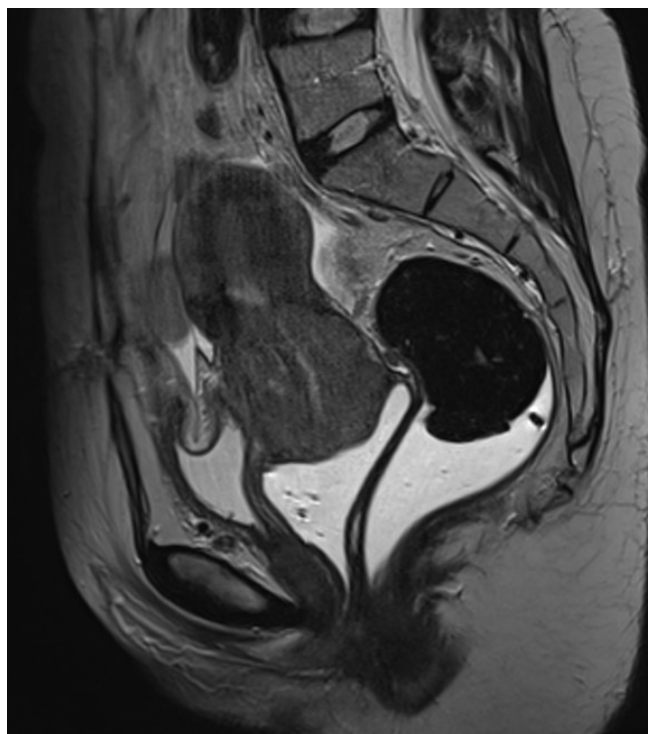
#### Brachytherapie

- Einlage Applikator
- Planungs-CT
- MRT zur Bestrahlungsplanung
- Bestrahlungsplanung
- Bestrahlung Fraktion 1 + am nächsten Morgen Fraktion 2 nach CT-Kontrolle
- Ziehen des Applikators
- Wdh. nach einer Woche

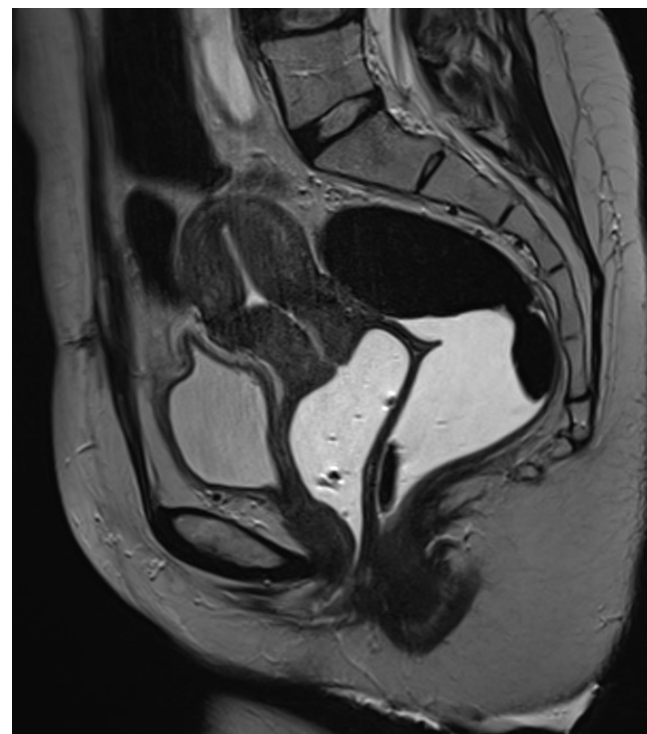
Gesamt-  
Behandlungszeit  
<50 Tage

# Zervixkarzinom

## Definitive Radiochemotherapie mit MR-geplanter Brachytherapie



Bei Therapiebeginn



Ende der EBRT

## Applikator Einlage Zervix



Ultraschall

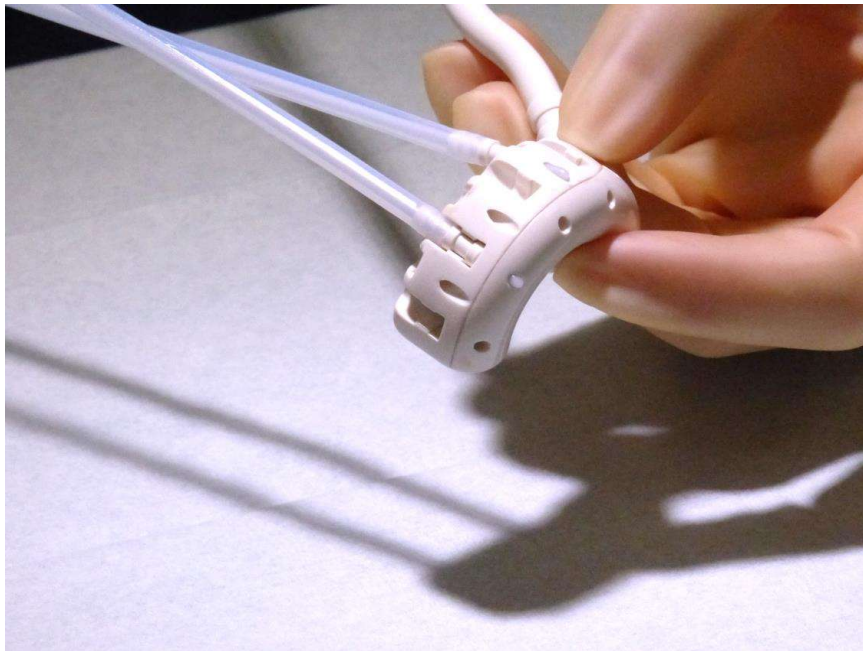
# Durchführung der Brachytherapie

## Anästhesie

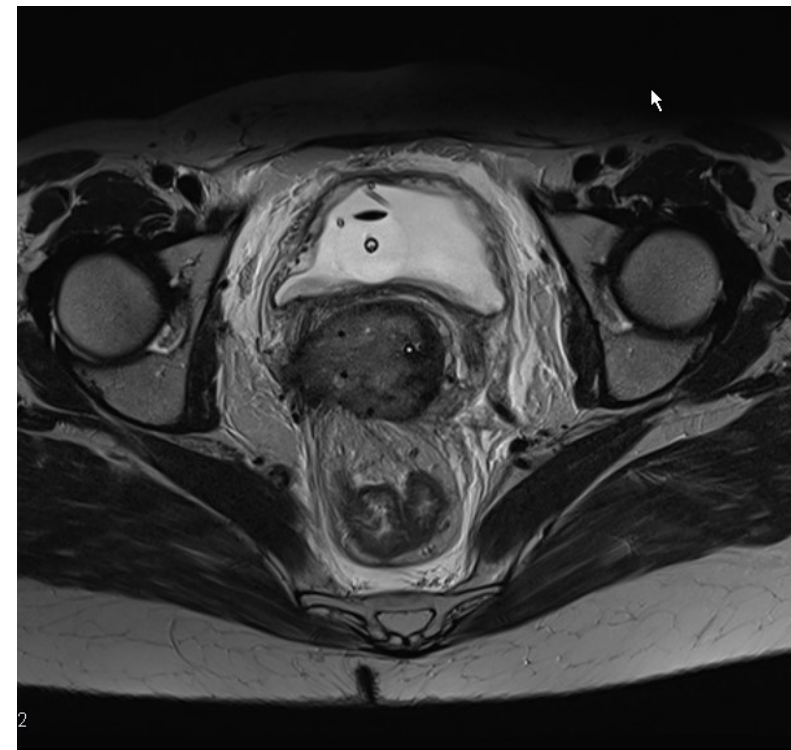
- **Lokalanästhesie**
- **Analgesedierung**
- **Periduralanästhesie**
  - **Vorteile:** Schmerzeinstellung wenn Applikator über Nacht verbleibt, keine Vollnarkose notwendig
  - **Nachteile:** nicht alle Pat. geeignet, wenn schlechte Positionierung: keine adäquate Analgesie, Kontraindikationen, Komplikationen
- **Vollnarkose**
  - **Vorteil:** schnelle Durchführung
  - **Nachteil:** keine Analgesie wenn Applikator über Nacht verbleibt, ggf. Schmerzpumpe notwendig



## Applikator Einlage Zervixkarzinom



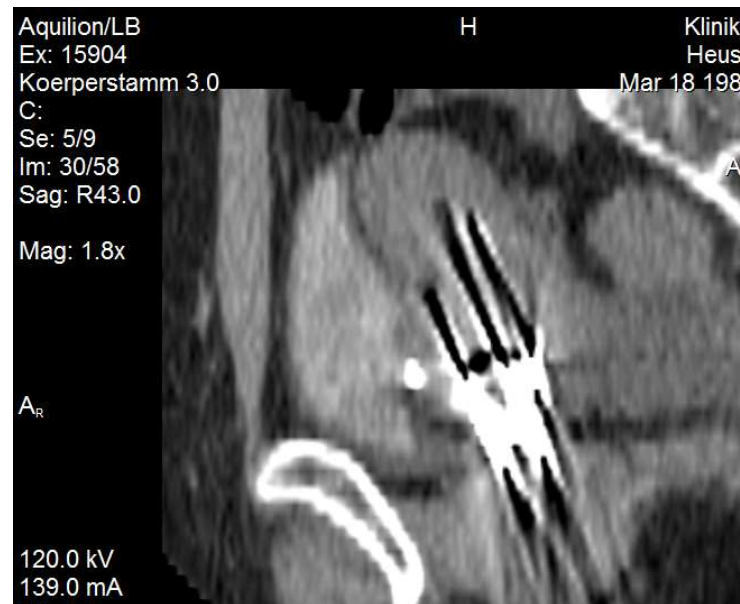
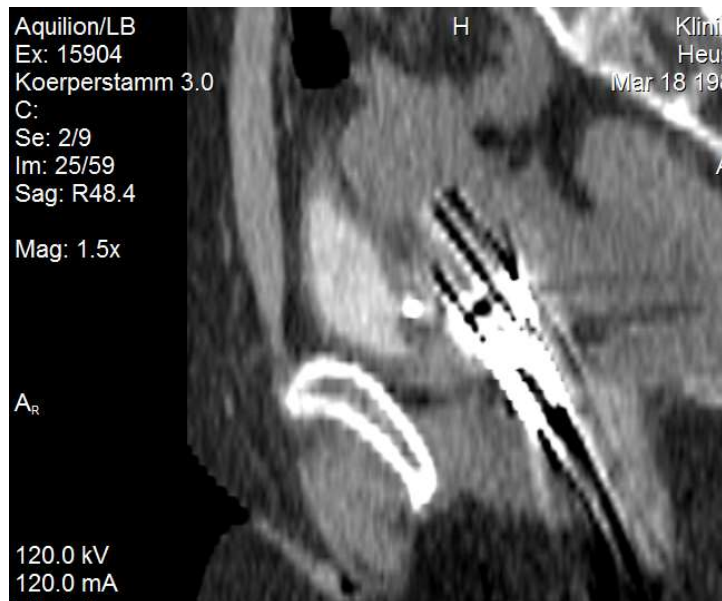
## MRT zur Bestrahlungsplanung Mit liegendem Applikator



## Ggf. Planungs-CT

### Positionierung Interstitielle Nadeln

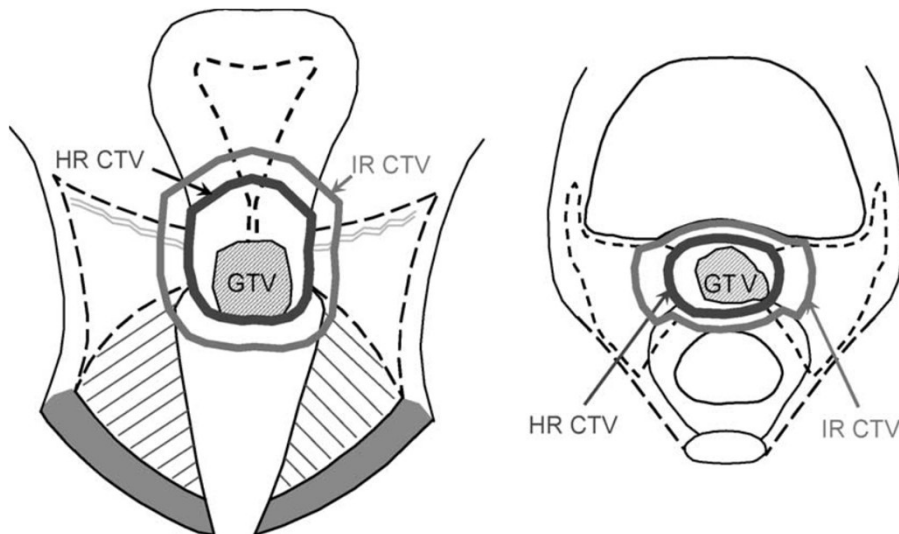
- Ggf. Anpassung der interstitiellen Nadeln
- Applikator/Nadel-Rekonstruktion
- Am 2. Tag MRT od CT Kontrolle



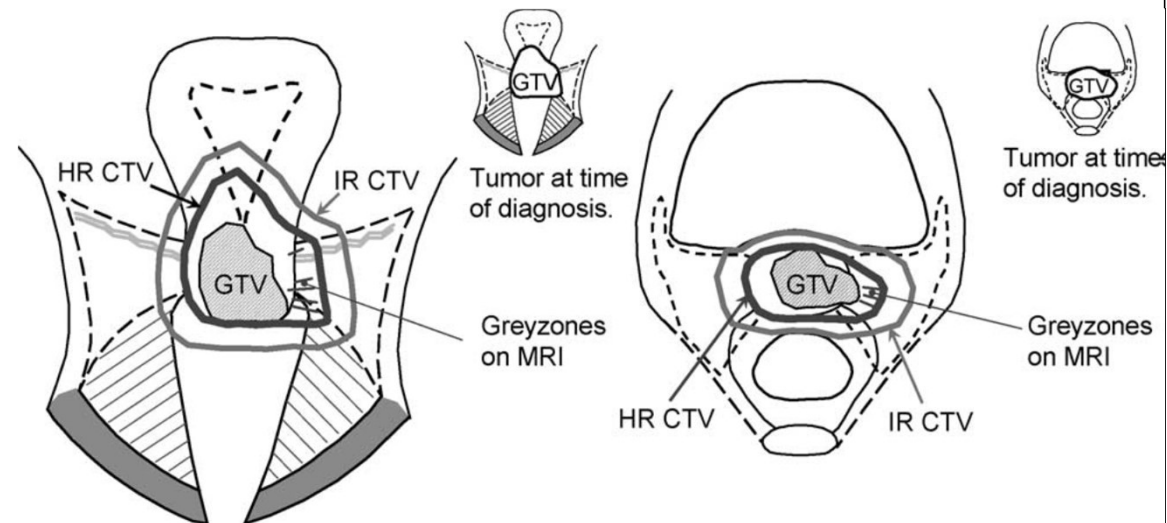
# Zielvolumendefinition Adaptives Konzept

Recommendations from Gynaecological (GYN) GEC-ESTRO Working Group<sup>☆</sup> (I): concepts and terms in 3D image based 3D treatment planning in cervix cancer brachytherapy with emphasis on MRI assessment of GTV and CTV

Limited disease:

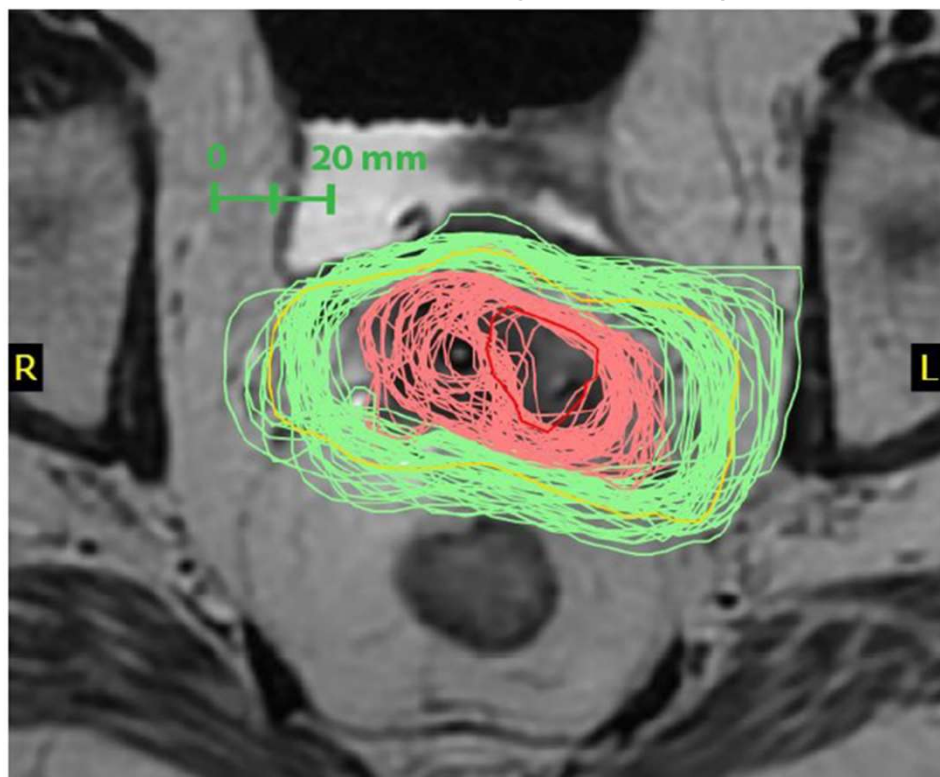


Advanced disease:

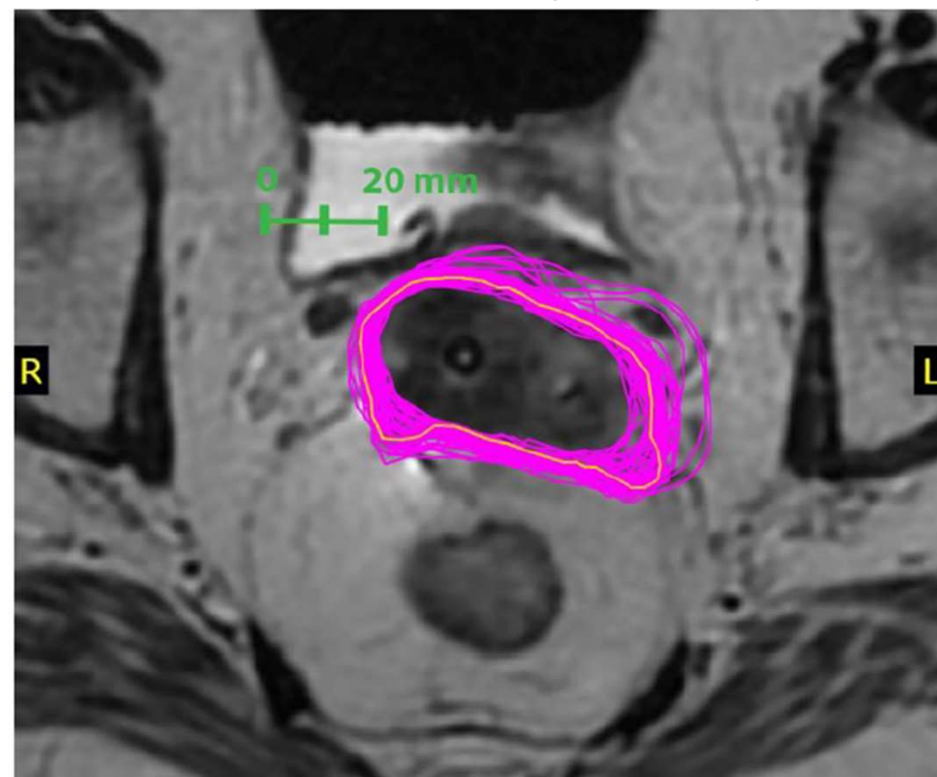


# Zielvolumendefinition Brachytherapie

Vor Konturierungs-Workshop



Nach Konturierungs-Workshop



# Dosiskonzept



# Dosiskonzept

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Tumor  
 $\alpha/\beta$ : 10Gy

OAR  
 $\alpha/\beta$ : 3 Gy

Kumulative Dosis: EBRT + Brachytherapie

# Perkutanes Dosiskonzept

## VMAT

Angestrebte Zieldosis:

- **Kein Mittelblock, Kein Boost auf Primarius oder Parametrien** -> hier Brachytherapie
- **Befallene LK sollten EQD2 ~ 60 Gy erhalten (SIB od sequentiell)**

| ZV                                                                     | Fx | ED     | GD             | EQD2 <sub>10</sub> | BT     | GD    |
|------------------------------------------------------------------------|----|--------|----------------|--------------------|--------|-------|
| Primarius + Zervix + Parametrien + LAW                                 | 25 | 1.8 Gy | <b>45 Gy</b>   |                    |        |       |
| LK im Becken<br>(iliakal intern/extern,<br>obturatorisch)              | 25 | 2.2 Gy | <b>55 Gy</b>   | 56 Gy              | 3-4 Gy | 60 Gy |
| LK außerhalb des Beckens<br>(iliakal commun.,<br>paraaortal, inguinal) | 25 | 2.3 Gy | <b>57.5 Gy</b> | 59 Gy              |        |       |

EMBRACE II

# Dosiskonzept

## Kumulative Dosis EBRT und BT

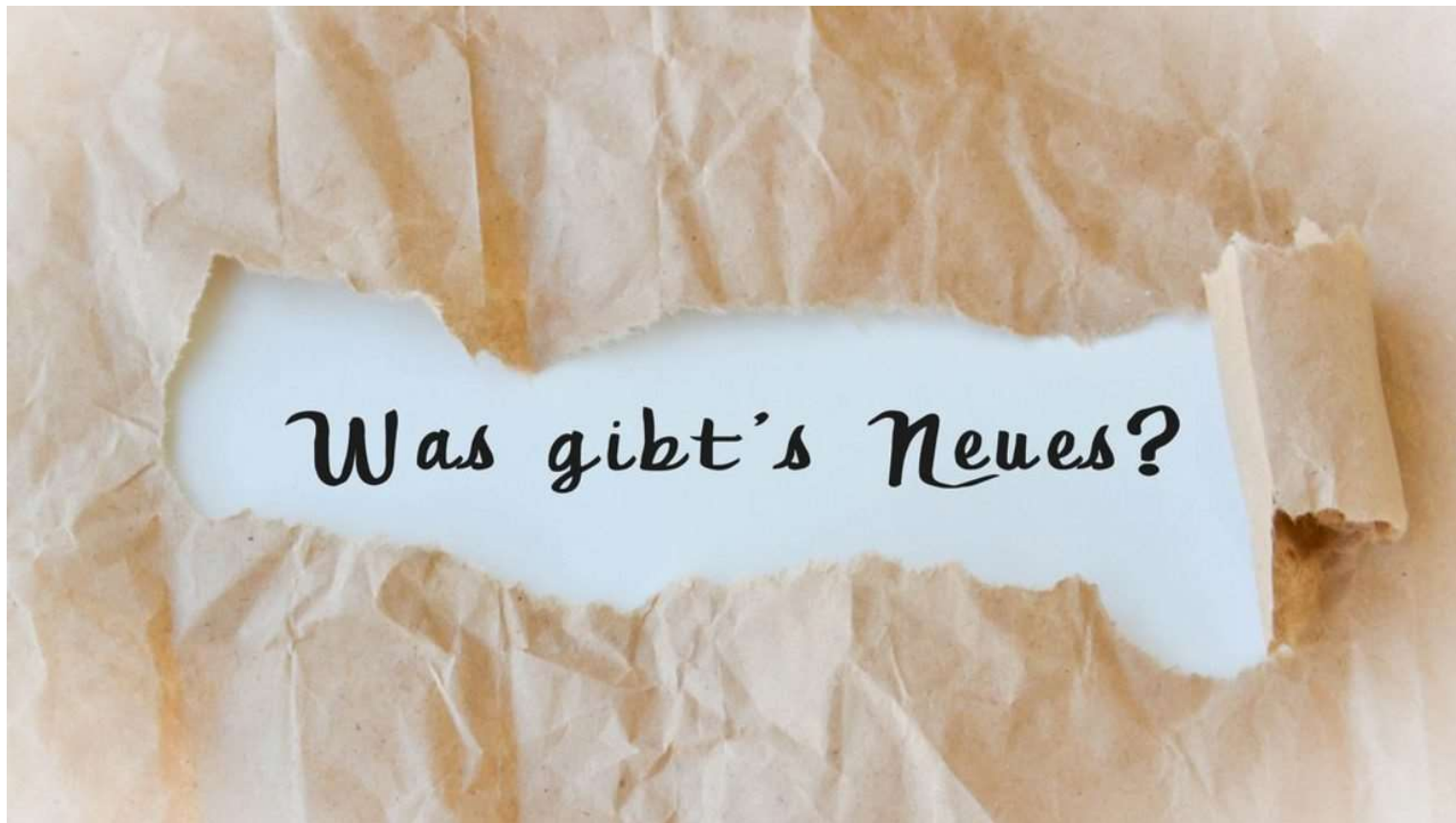
| Target                     | D90 CTV <sub>HR</sub><br>EQD2 <sub>10</sub>                | D98 CTV <sub>HR</sub><br>EQD2 <sub>10</sub>               | D98 GTV <sub>res</sub><br>EQD2 <sub>10</sub> | D98 CTV <sub>IR</sub><br>EQD2 <sub>10</sub>                | Point A<br>EQD2 <sub>10</sub>                            |
|----------------------------|------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------------|------------------------------------------------------------|----------------------------------------------------------|
| Planning Aims              | > 90 Gy<br>< 95 Gy                                         | > 75 Gy                                                   | >95 Gy                                       | > 60 Gy                                                    | > 65 Gy                                                  |
| Limits for Prescribed Dose | > 85 Gy                                                    | -                                                         | >90 Gy                                       | -                                                          | -                                                        |
|                            |                                                            |                                                           |                                              |                                                            |                                                          |
| OAR                        | Bladder D <sub>2cm</sub> <sup>*</sup><br>EQD2 <sub>3</sub> | Rectum D <sub>2cm</sub> <sup>*</sup><br>EQD2 <sub>3</sub> | Recto-vaginal<br>point EQD2 <sub>3</sub>     | Sigmoid D <sub>2cm</sub> <sup>*</sup><br>EQD2 <sub>3</sub> | Bowel D <sub>2cm</sub> <sup>*</sup><br>EQD2 <sub>3</sub> |
| Planning Aims              | < 80 Gy                                                    | < 65 Gy                                                   | < 65 Gy                                      | < 70 Gy*                                                   | < 70 Gy*                                                 |
| Limits for Prescribed Dose | < 90 Gy                                                    | < 75 Gy                                                   | < 75 Gy                                      | < 75 Gy*                                                   | < 75 Gy*                                                 |

*\* for the sigmoid/bowel structures these dose constraints are valid in case of non-mobile bowel loops resulting in the situation that the most exposed volume is located at a similar part of the organ*

EMBRACE II

# Zervixkarzinom

## Studienlage



# Zervixkarzinom

## EMBRACE I Studie



THE LANCET  
Oncology

ARTICLES | [VOLUME 22, ISSUE 4, P538-547, APRIL 01, 2021](#)

### MRI-guided adaptive brachytherapy in locally advanced cervical cancer (EMBRACE-I): a multicentre prospective cohort study

[Prof Richard Pötter, MD](#) • [Prof Kari Tanderup, PhD](#) • [Maximilian Paul Schmid, MD](#)  

[Ina Jürgenliemk-Schulz, PhD](#) • [Christine Haie-Meder, MD](#) • [Lars Ulrik Fokdal, PhD](#) • et al. [Show all authors](#)

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## Zervixkarzinom

### EMBRACE I Studie



#### ■ 2008-2015

■ **Patienten:** N=1341, med. Alter 49 Jahre

#### ■ FIGO Stadium

IB1: 9.2% (124)

IB2: 8.9% (119)

IIA1: 2.8% (38)

IIA2: 2.3% (31)

IIB: 51.7% (693)

IIIA: 1% (13)

IIIB: 14.2% (190)

IVA: 2.5% (34)

IVB 7.3% (98)

#### ■ Nodal Status

N0: 48% (641)

N1: 52% (699)

#### ■ Histologie

SCC: 81.8% (1097)

Adeno: 14.3% (192)

Adenosquamous: 3.7% (50)

## Zervixkarzinom

### EMBRACE I Studie



## Therapie

- **Mediane EBRT-Dosis (IQR): 45 Gy (45-46)**
- Begleitende Chemotherapie: 95% (1247)
- BT: Intrakavitär: 57% (753); Intrakavitär/interstitiell: 43% (565)
- Medianes CTV-HR-Volumen (IQR): 28 cm<sup>3</sup> (20-40)
- **Median D90 für CTV-HR (IQR): 90 Gy (85-94)**
- Mittlere OTT (IQR): 46 Tage (42-49)

# Zervixkarzinom

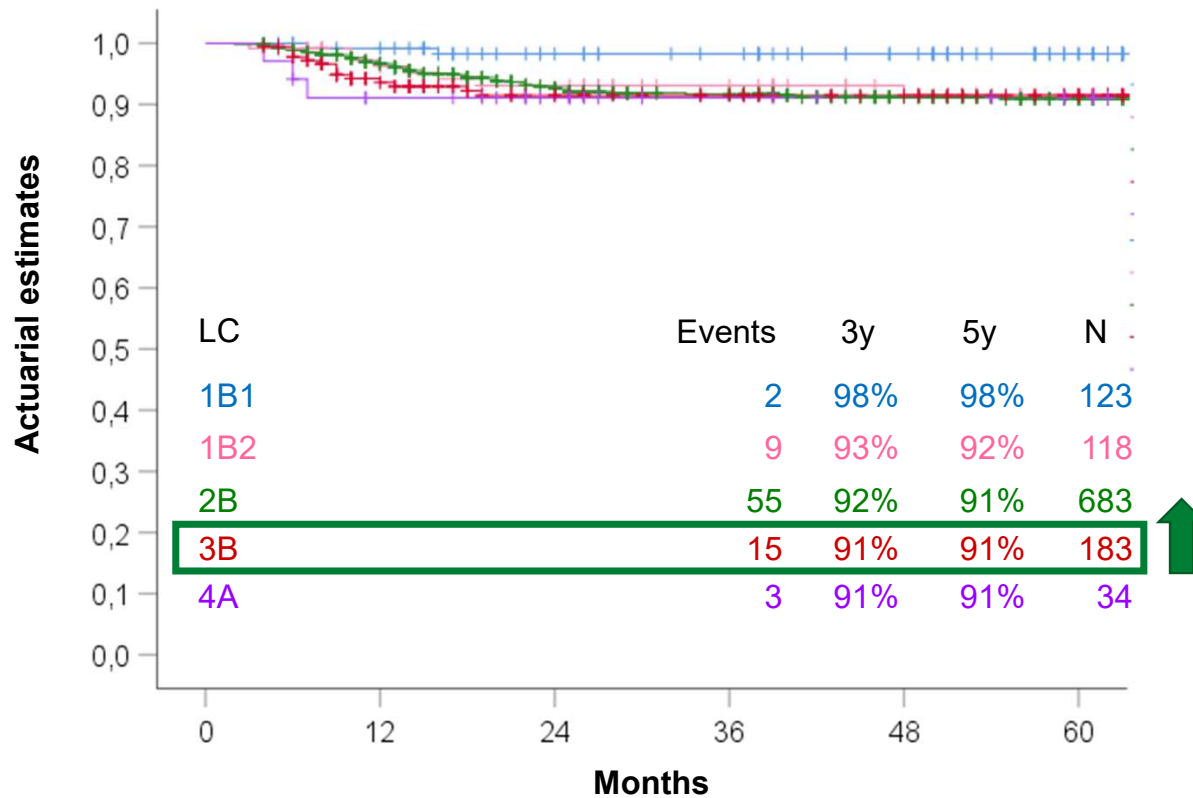
## EMBRACE I Studie



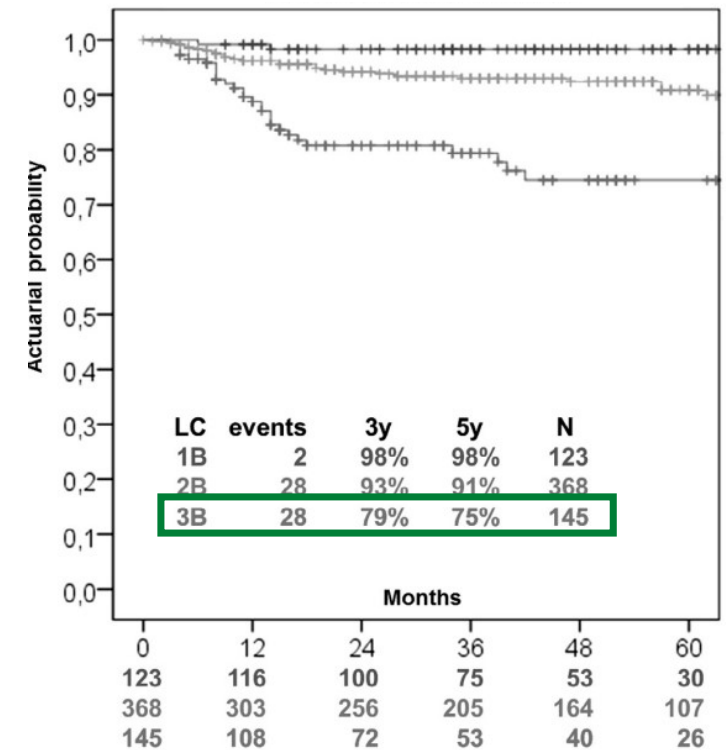
EMBRACE

{ An international study  
on MRI-guided BRachytherapy  
in locally Advanced CERvical cancer }

Local control and FIGO stage  
EMBRACE I



Local control and FIGO stage  
RetroEMBRACE

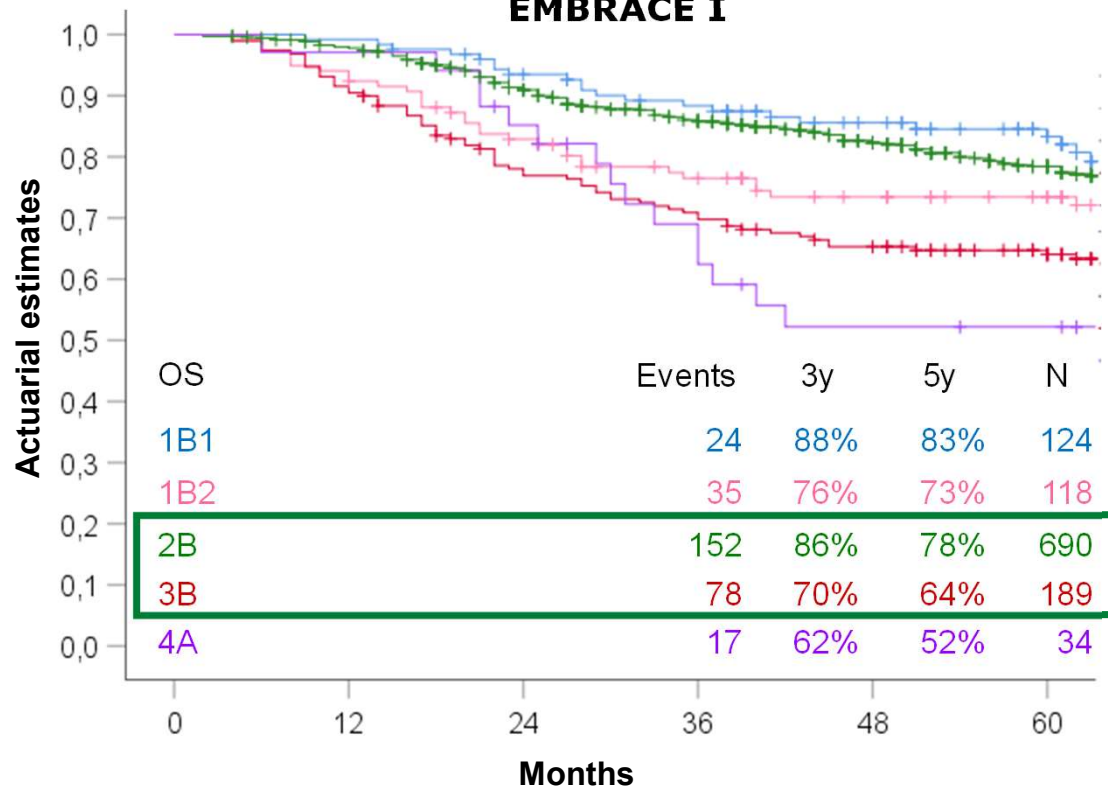


# Zervixkarzinom

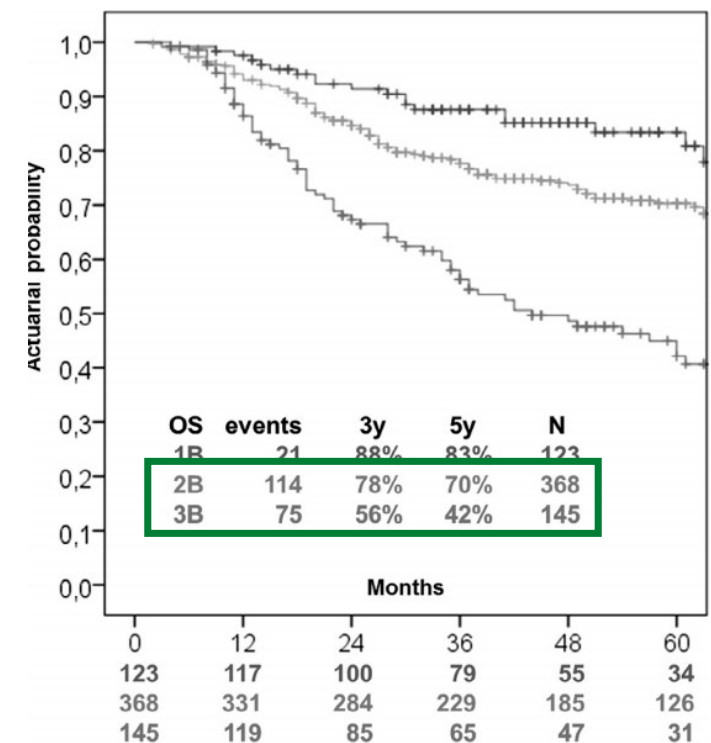
## EMBRACE I Studie



Overall survival and FIGO stage  
EMBRACE I

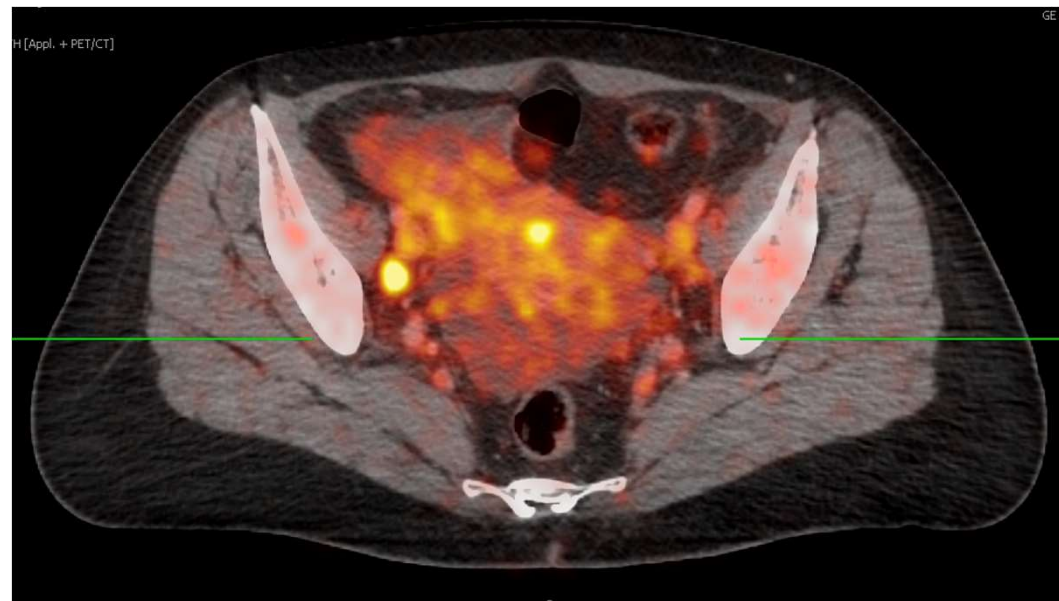


Overall survival and FIGO stage  
RetroEMBRACE



# Zervixkarzinom

## EMBRACE I Studie



| Nodalstatus | # Patienten | 5-Jahres LK Kontrolle | 5-Jahres distante Kontrolle |
|-------------|-------------|-----------------------|-----------------------------|
| N0          | 641         | 93%                   | 88%                         |
| N1          | 699         | 81%                   | 81%                         |



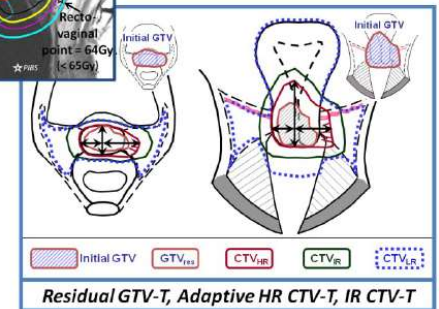
# EMBRACE II Studie



- **Prospektive Interventionsstudie**
- **Zielvolumina und Dosisverschreibung für BT und EBRT** im Protokoll vorgegeben
- 46 Zentren

Image guided intensity modulated  
External beam radiochemotherapy and  
MRI based adaptive BRachytherapy  
in locally advanced CErvical cancer

## EMBRACE-II



# Zervixkarzinom

## EMBRACE II

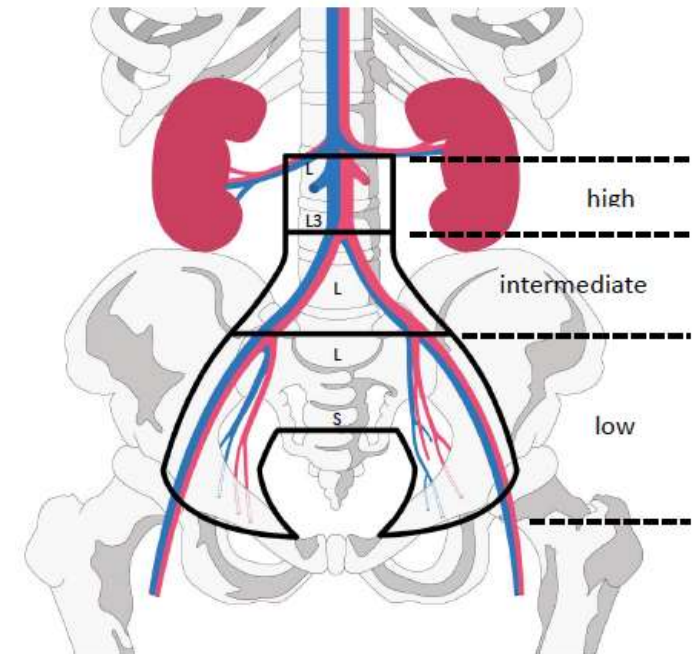


EMBRACE

{ An international study  
on MRI-guided BRachytherapy  
in locally Advanced CErvical cancer }

### ■ Zielvolumen EBRT Lymphabfluss

| Risk Group             | Definition                                                      | EBRT LN Regions                                                                                           |
|------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Low Risk (LN)          | ≤ 4 cm<br>Stage IA-IIA1<br>SCC<br>No Uterine Invasion           | <b>Small Pelvis</b>                                                                                       |
| Intermediate Risk (LN) | No Low Risk or High Risk Features                               | <b>Large Pelvis</b><br>Small Pelvis Nodes+<br>Common Iliac Nodes                                          |
| High Risk (HR)         | ≥ 1 node at Common Iliac or above<br>OR<br>≥ 3 pathologic nodes | <b>Large Pelvis + PA<br/>(Upper border of L2)</b><br><br>At least 3 cm cranial to<br>PA Nodes if positive |

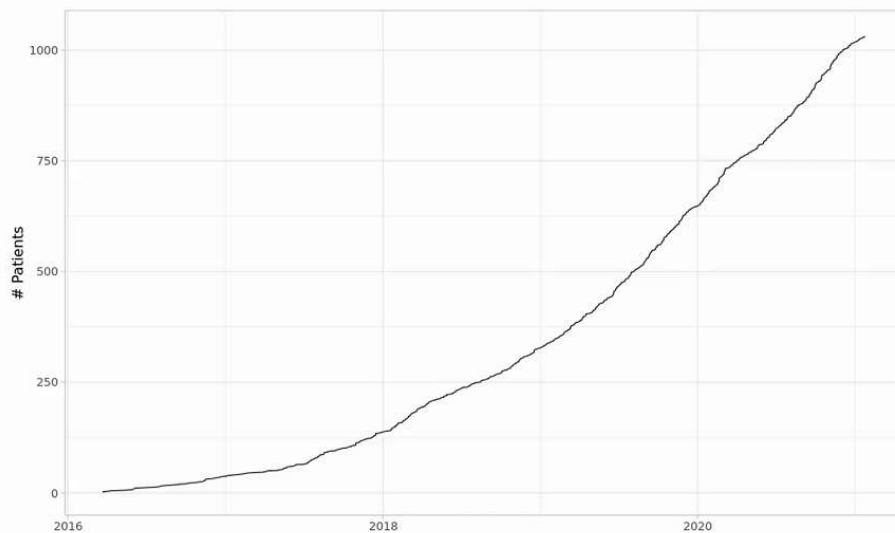


# Zervixkarzinom

## EMBRACE II Studie



Current status: patients



 **Registered patients:**  
1074

 **Created in database:**  
1038

 **Finished treatment:**  
795

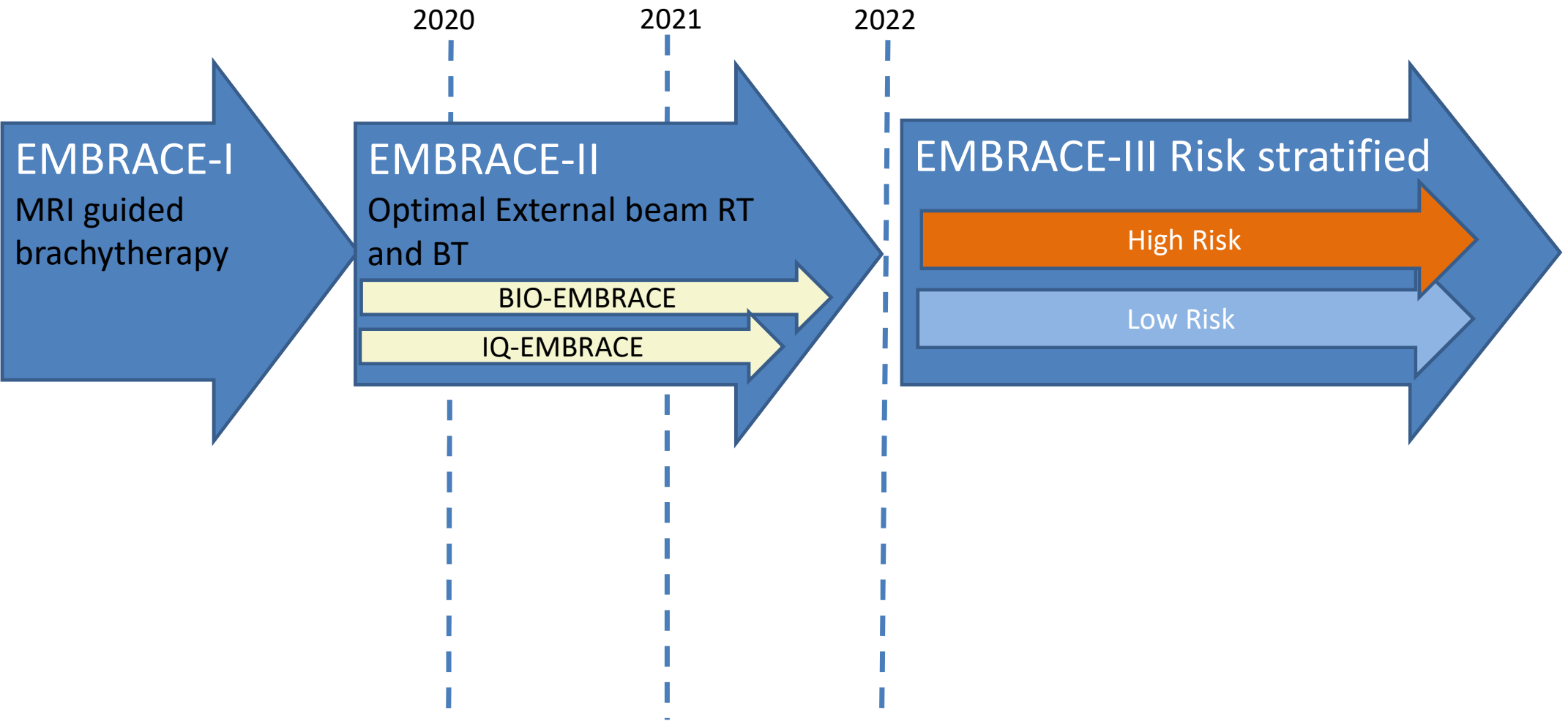
 **Median Followup:**  
12 months

Image guided intensity modulated  
External beam radiochemotherapy and  
MRI based adaptive BRachytherapy  
in locally advanced CErvical cancer

## EMBRACE-II

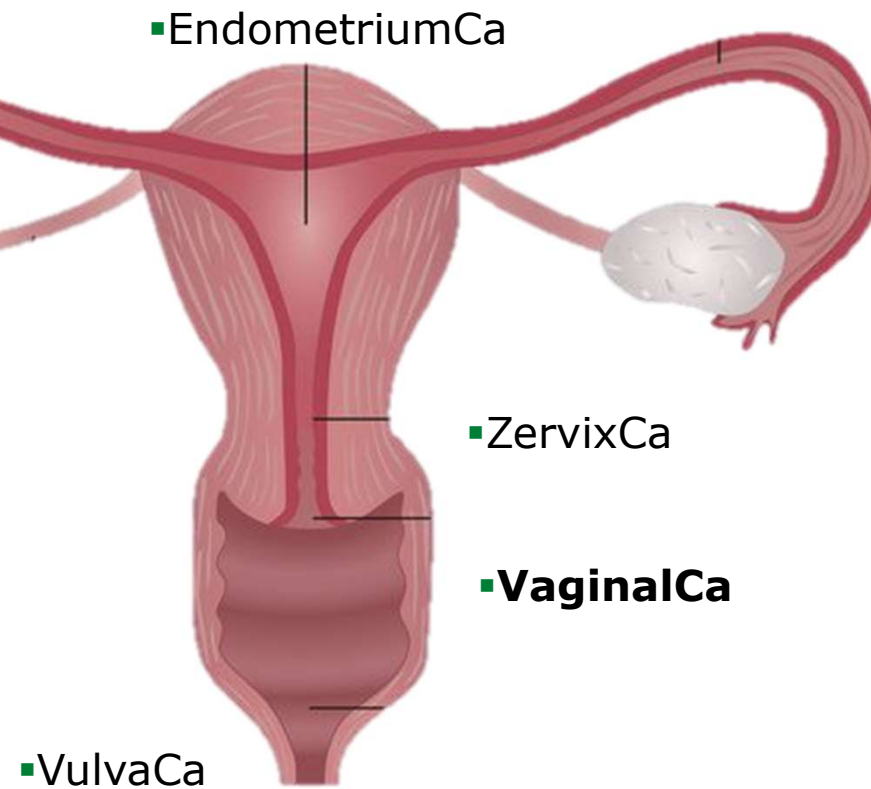
- **Rekrutierung Ende 2021 mit ~1400 Patientinnen abgeschlossen**
- Ergebnisse für 2025 erwartet

# Overview EMBRACE studies and future outlook



# Gynäkologische Tumore

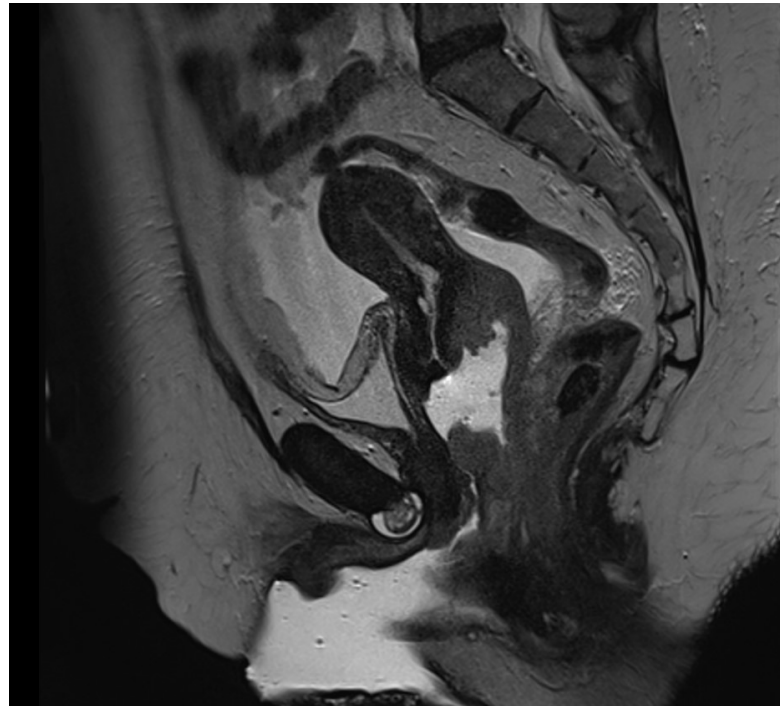
## Agenda



## Fallbeispiel

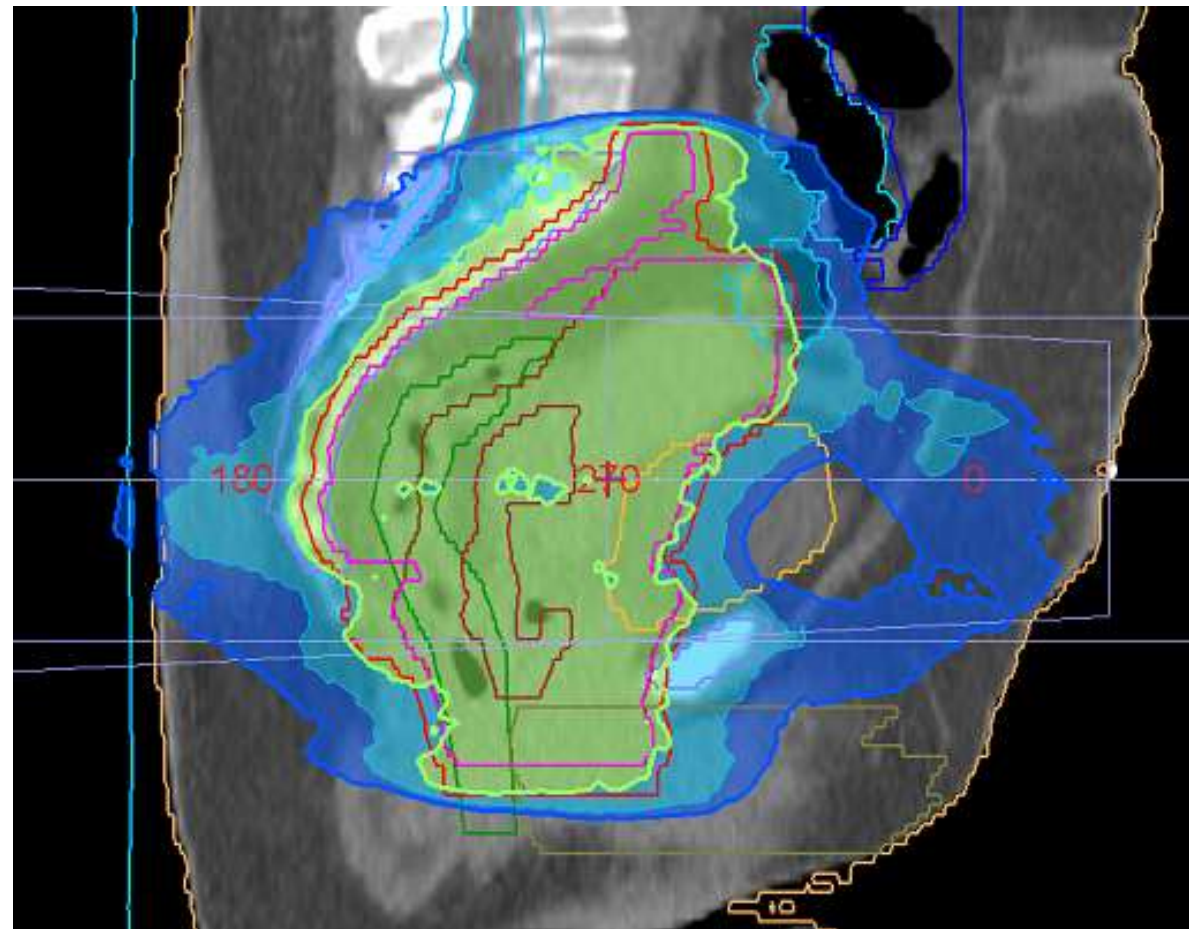
### Patientin: 49J

- Vaginalkarzinom (bis unteres drittel der Cervix reichend) cT2 pN0 (0/47) cM0
- Mäßiggradig differenziertes, teilweise ulceriertes und verhordnendes Plattenepithelkarzinom



**EBRT****Patientin: 49J**

- Primarius und LAW → 1,8 bis 45Gy
- Boost positive LK  
→ 2,2 bis 55Gy
- Konkomitant Cisplatin 40mg/m<sup>2</sup> KOF weekly



# Brachytherapie

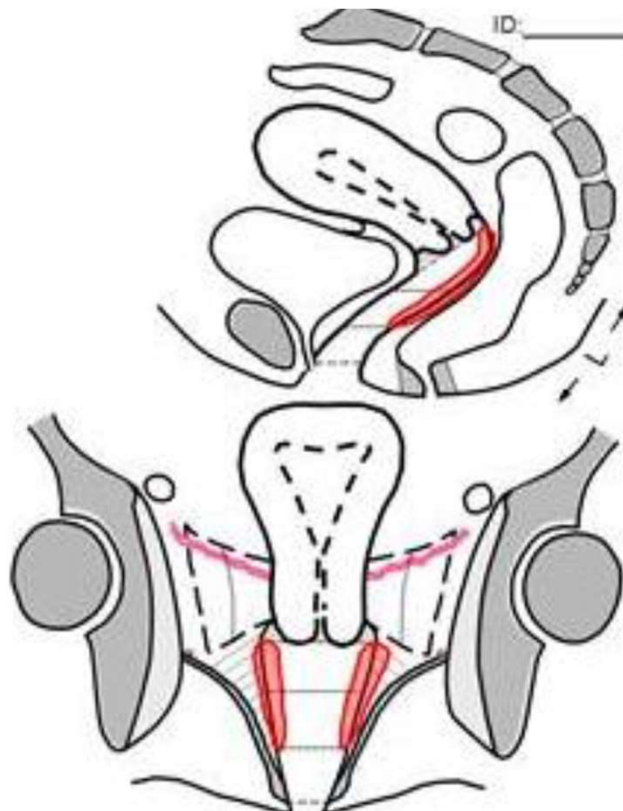
## Adaptives Konzept

Recommendations from gynaecological (GYN) GEC-ESTRO working group – ACROP: Target concept for image guided adaptive brachytherapy in primary vaginal cancer

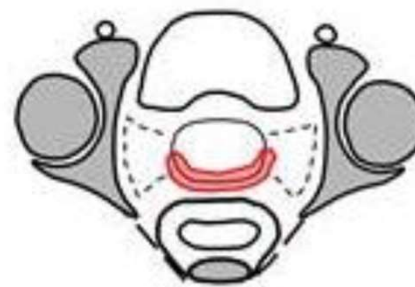


Maximilian P. Schmid<sup>a,\*</sup>, Lars Fokdal<sup>b</sup>, Henrike Westerveld<sup>c</sup>, Cyrus Chargari<sup>d</sup>, Lisbeth Rohl<sup>e</sup>, Philippe Morice<sup>f</sup>, Nicole Nesvacil<sup>a</sup>, Renaud Mazon<sup>d,1</sup>, Christine Haie-Meder<sup>d</sup>, Richard Pötter<sup>a</sup>, Remi A. Nout<sup>g,h</sup>, on behalf of the GEC-ESTRO GYN Working Group

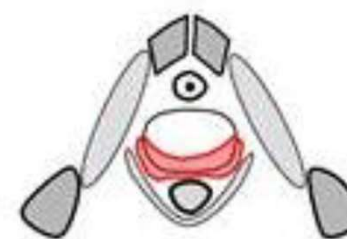
<sup>a</sup>Department for Radiation Oncology, Medical University of Vienna, Austria; <sup>b</sup>Department of Oncology, Aarhus University Hospital, Denmark; <sup>c</sup>Department of Radiotherapy, Amsterdam University Medical Centers, AMC, the Netherlands; <sup>d</sup>Brachytherapy Unit, Gustave Roussy Cancer Campus, Villejuif, France; <sup>e</sup>Department of Radiology, Aarhus University Hospital, Denmark; <sup>f</sup>Surgery Department, Gustave Roussy Cancer Campus, Villejuif, France; <sup>g</sup>Department of Radiation Oncology, Leiden University Medical Center, the Netherlands; <sup>h</sup>Department of Radiation Oncology, Erasmus MC Cancer Institute, Erasmus University Medical Center Rotterdam, The Netherlands



Clinical Drawing: Vagina + intact uterus



Upper 1/3 vagina



Middle 1/3 vagina



Lower 1/3 vagina

Notes:

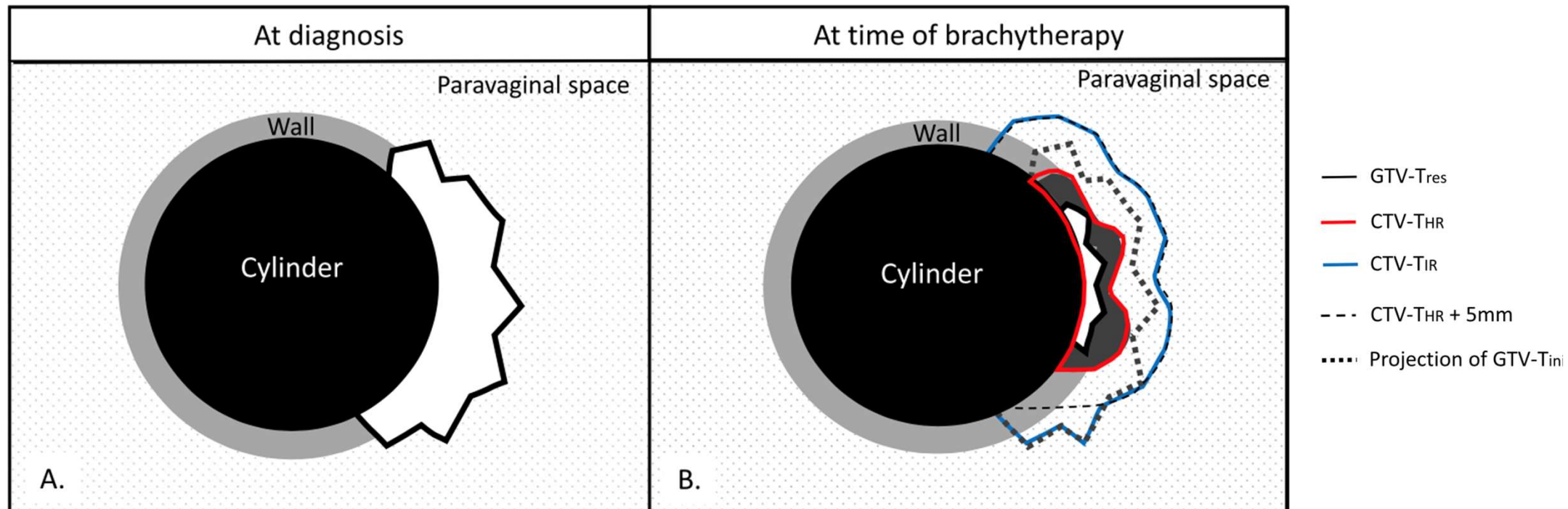
# Brachytherapie Adaptives Konzept

Recommendations from gynaecological (GYN) GEC-ESTRO working group – ACROP: Target concept for image guided adaptive brachytherapy in primary vaginal cancer



Maximilian P. Schmid<sup>a,\*</sup>, Lars Fokdal<sup>b</sup>, Henrike Westerveld<sup>c</sup>, Cyrus Chargari<sup>d</sup>, Lisbeth Rohl<sup>e</sup>, Philippe Morice<sup>f</sup>, Nicole Nesvacil<sup>a</sup>, Renaud Mazon<sup>d,1</sup>, Christine Haie-Meder<sup>d</sup>, Richard Pötter<sup>a</sup>, Remi A. Nout<sup>g,h</sup>, on behalf of the GEC-ESTRO GYN Working Group

<sup>a</sup>Department for Radiation Oncology, Medical University of Vienna, Austria; <sup>b</sup>Department of Oncology, Aarhus University Hospital, Denmark; <sup>c</sup>Department of Radiotherapy, Amsterdam University Medical Centers, AMC, the Netherlands; <sup>d</sup>Brachytherapy Unit, Gustave Roussy Cancer Campus, Villejuif, France; <sup>e</sup>Department of Radiology, Aarhus University Hospital, Denmark; <sup>f</sup>Surgery Department, Gustave Roussy Cancer Campus, Villejuif, France; <sup>g</sup>Department of Radiation Oncology, Leiden University Medical Center, the Netherlands; <sup>h</sup>Department of Radiation Oncology, Erasmus MC Cancer Institute, Erasmus University Medical Center Rotterdam, The Netherlands



# Vaginal Ca Leitlinie



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## Radiotherapy and Oncology

journal homepage: [www.thegreenjournal.com](http://www.thegreenjournal.com)



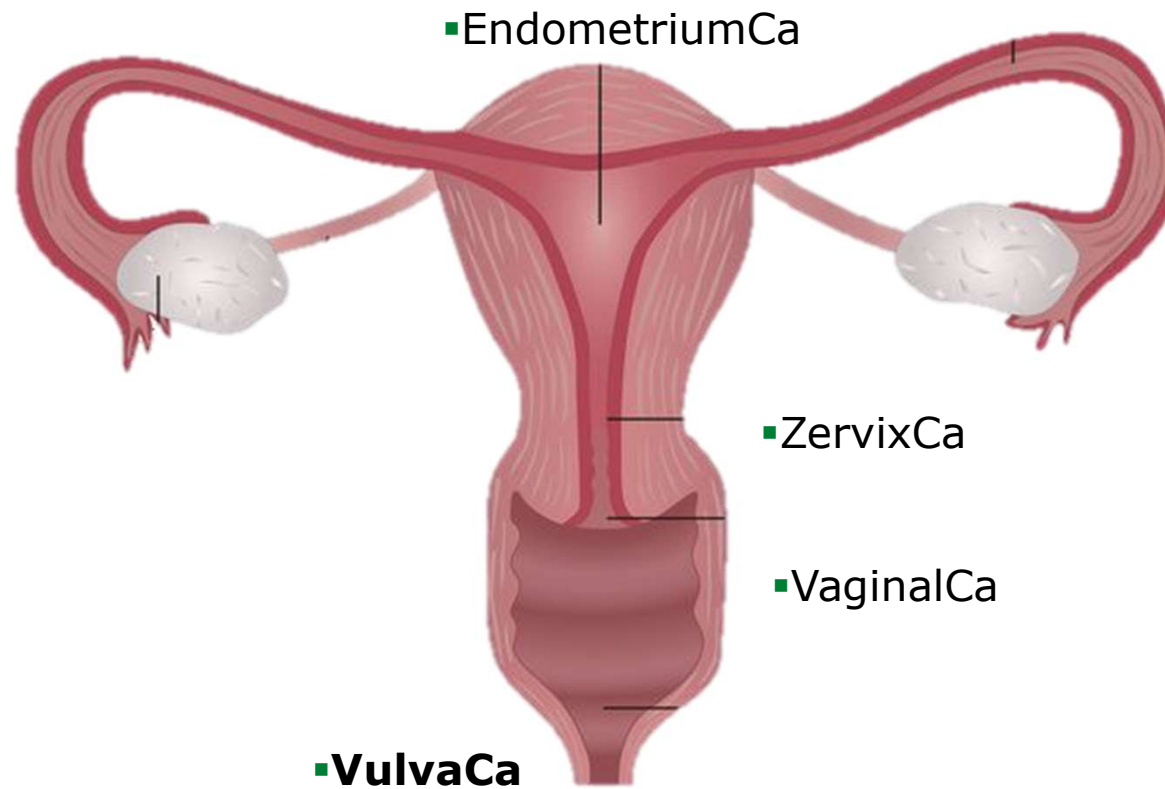
Original Article

### ESTRO/ESGO/SIOPe guidelines for the management of patients with vaginal cancer ☆

Remi Nout<sup>a,\*</sup>, Gabriele Calaminus<sup>b</sup>, François Planchamp<sup>c</sup>, Cyrus Chargari<sup>d</sup>, Sigurd F. Lax<sup>e</sup>,  
Hélène Martelli<sup>f</sup>, W Glenn McCluggage<sup>g</sup>, Philippe Morice<sup>h</sup>, Maja Pakiz<sup>i</sup>, Maximilian Paul Schmid<sup>j</sup>,  
Jonáh Stunt<sup>a</sup>, Beate Timmermann<sup>k</sup>, Christian Vokuhl<sup>l</sup>, Daniel Orbach<sup>m</sup>, Christina Fotopoulou<sup>n</sup>

# Gynäkologische Tumore

## Agenda



## Therapie des fortgeschrittenen Vulva-Ca

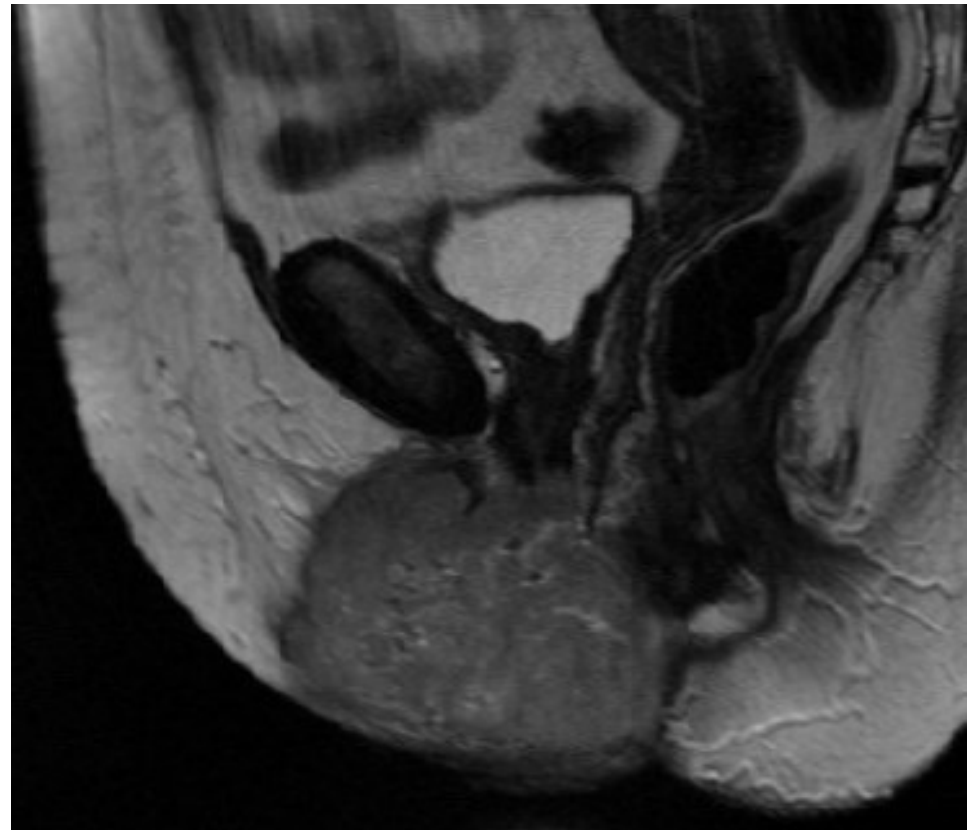
### EBRT und BT

#### **Primäre Radiochemotherapie mit BT:**

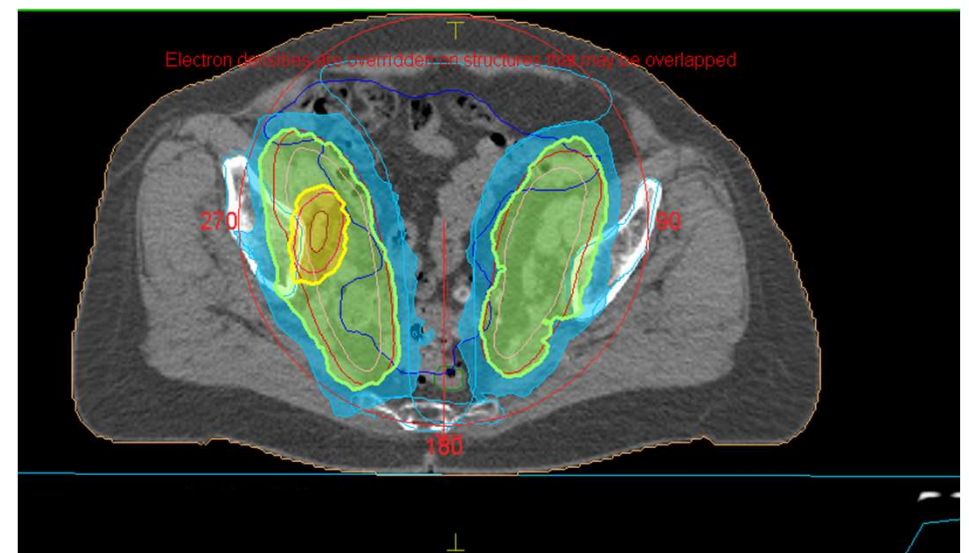
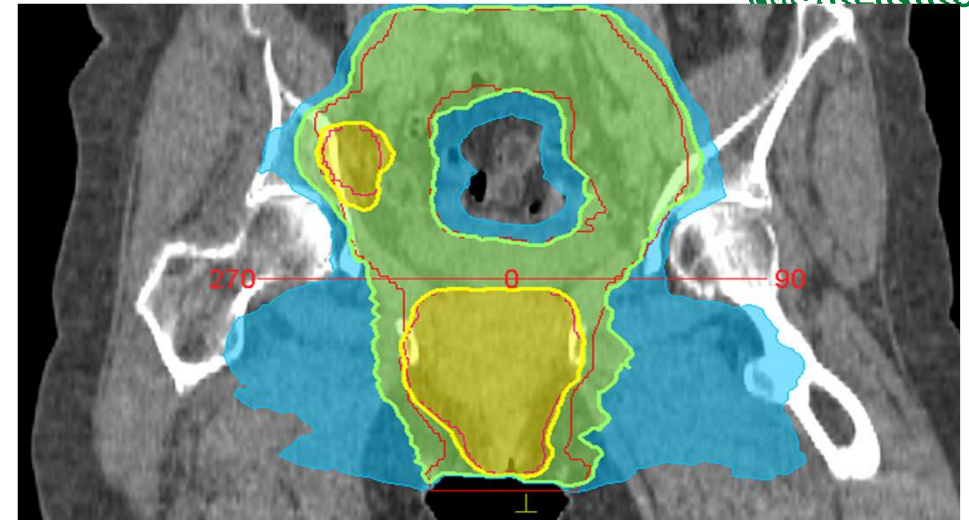
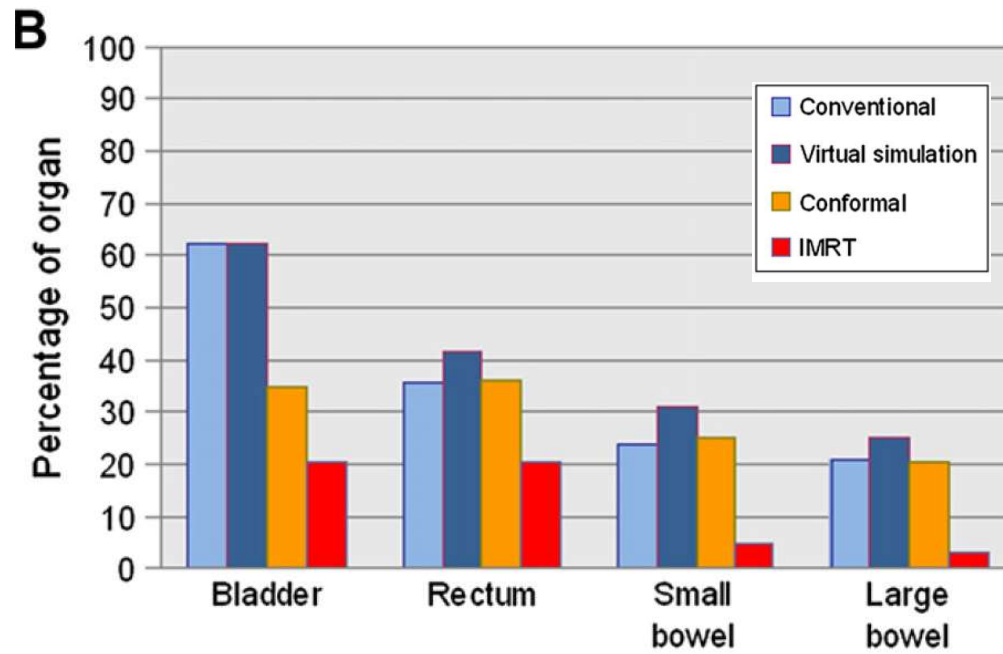
- Organ- und Funktionserhaltender Ansatz
- Bei Inoperabilität

#### **Bedingungen für primäre OP:**

- In-sano Resektion
- Defektdeckung

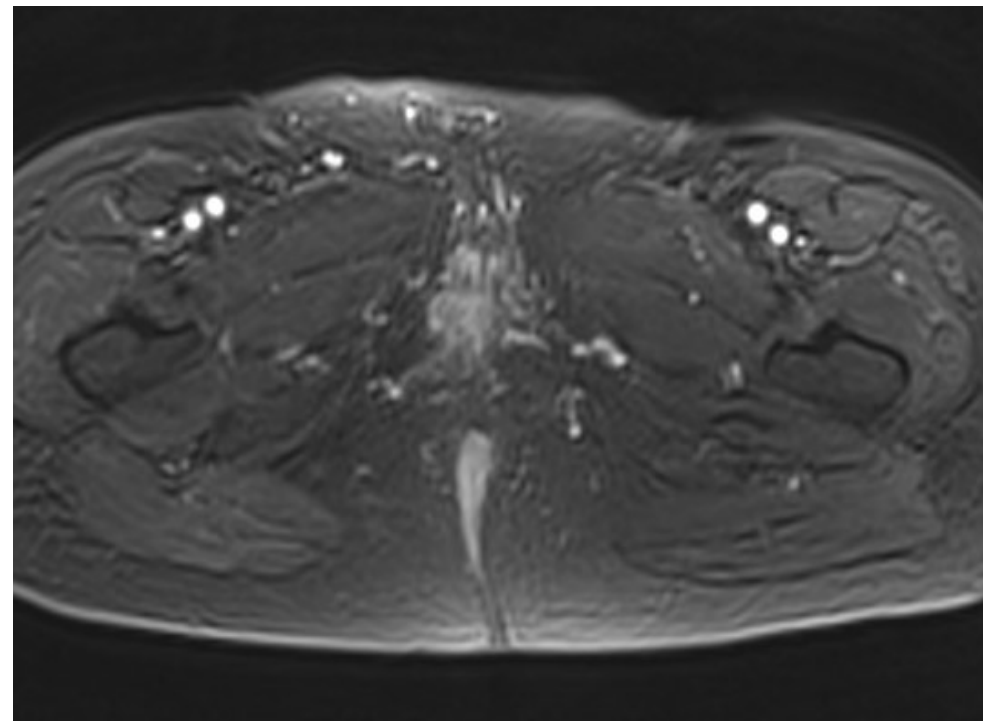
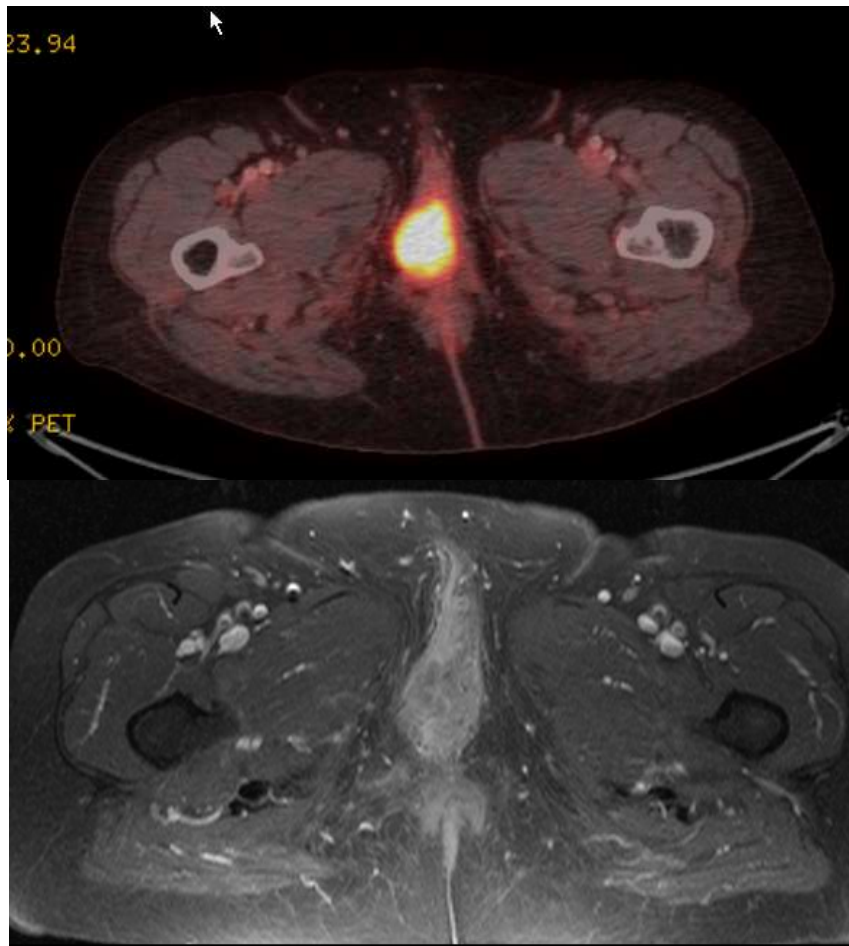


# Moderne EBRT IMRT/VMAT

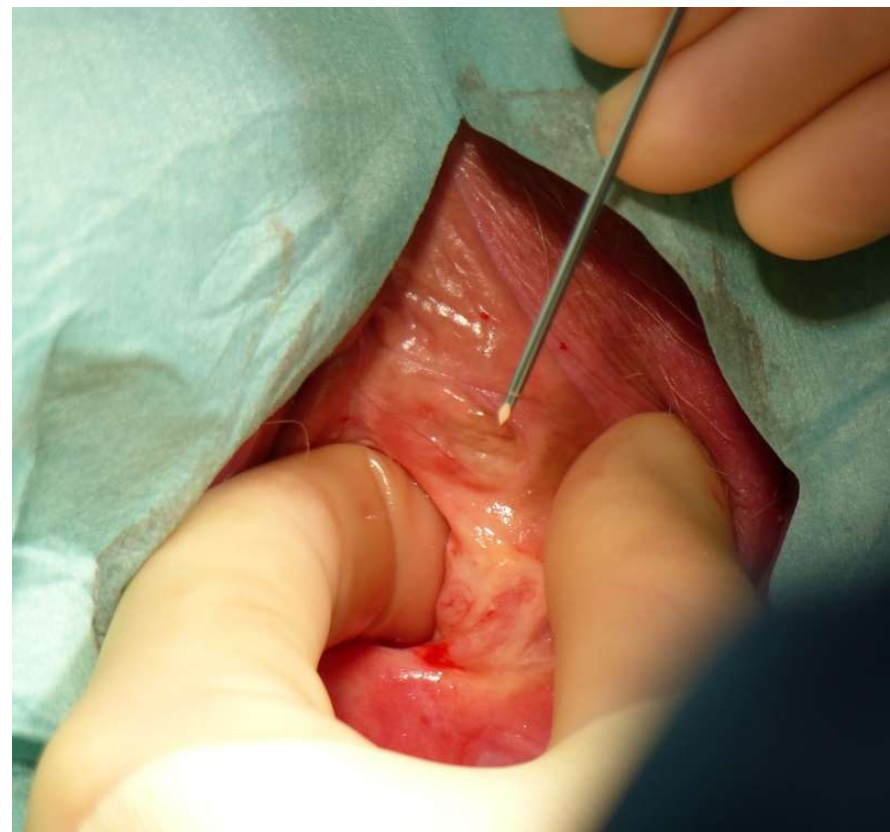


# Interstitielle Brachytherapie

## Vulva



## Interstitielle Brachytherapie Vulva



# Interstitielle Brachytherapie

## Vulva



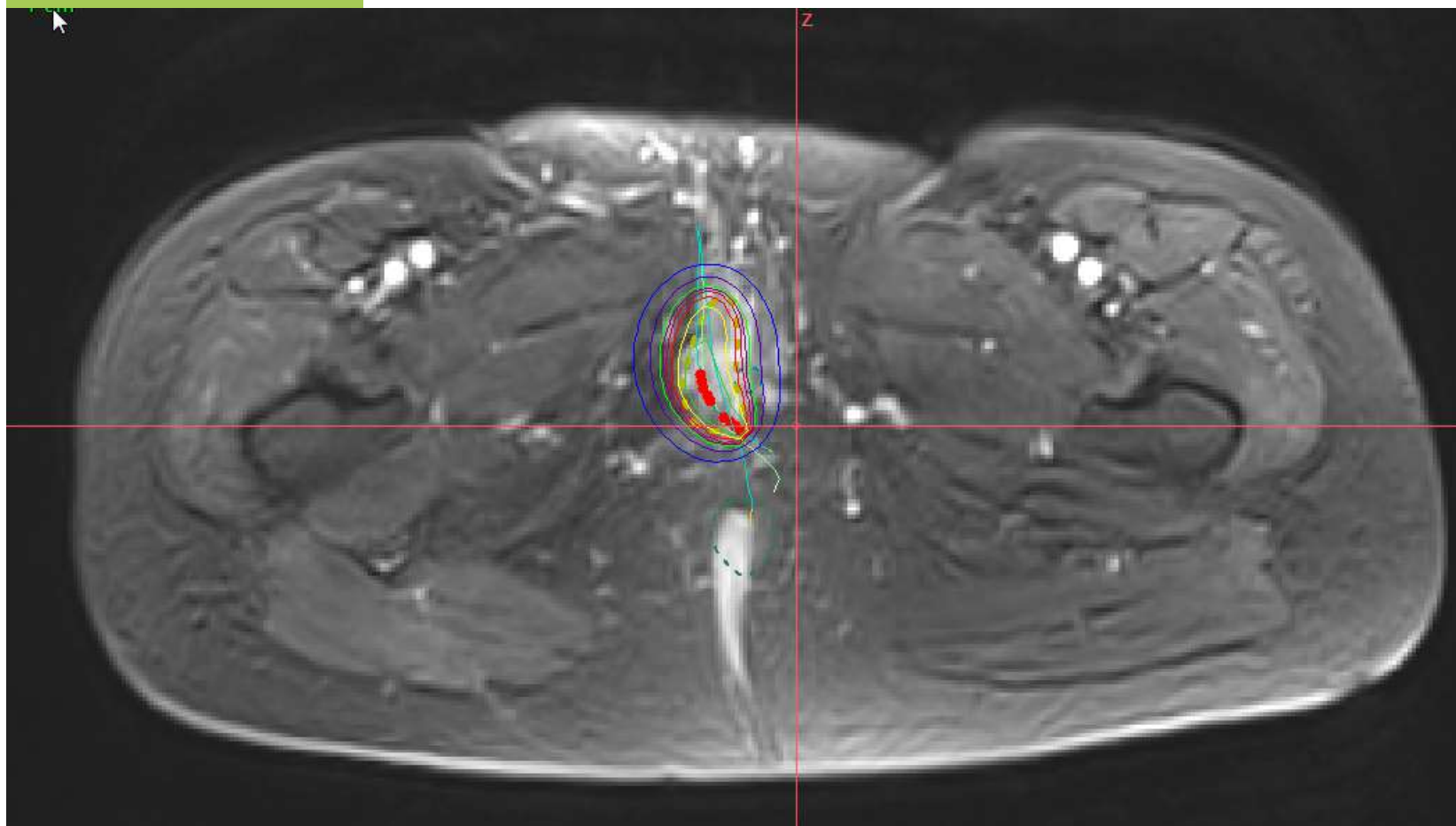
# Interstitielle Brachytherapie

## Vulva



# Brachytherapie

## MR-basierte



# Literatur

## GEC-ESTRO Handbook

ESTRO - E-Library Item

estro.org/library/item/2279/the-gec-estro-handbook-of-brachytherapy-...

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Authors:

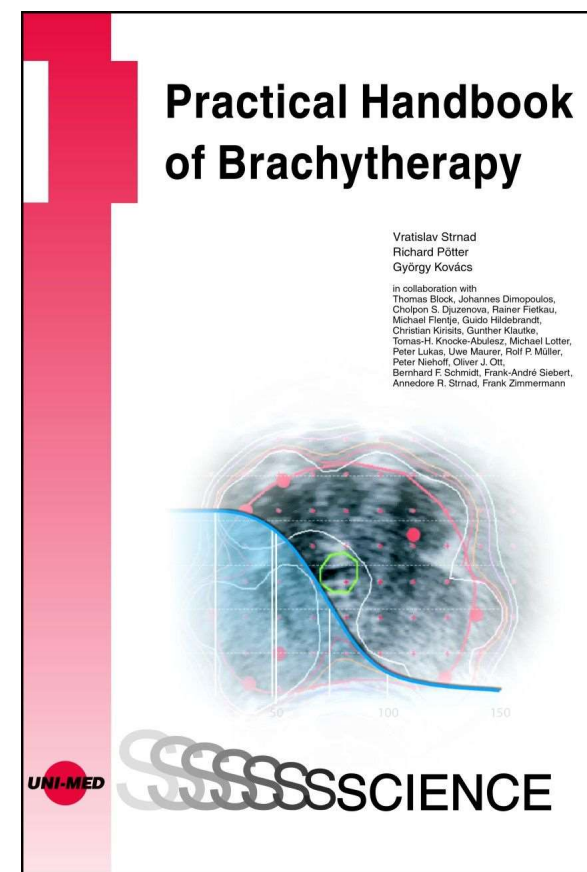
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- Die **moderne Radiotherapie mit Brachytherapie** ermöglicht sehr gute lokale Kontrollraten beim lokal fortgeschrittenem Gynäkologischen Tumoren
- **Ggf. Therapie an spezialisierten Zentren!**

**Vielen Dank**

**Für Ihre Aufmerksamkeit!**

