BRACHYTHERAPY PLAN EVALUATION : INTRACAVIDITARY & INTERSTITITIAL APPLICATIONS

DR KIRTHI KOUSHIK A S
ASSOCIATE PROFESSOR
RAMAIAH MEDICAL COLLEGE
WHAT TO EXPECT?

• How to do
• Useful tips
• How do I do it
• What are the variations or compromises
BROAD COMPONENTS OF PLAN EVALUATION

• DISPLAYING AND INTERPRETATION OF DOSE DISTRIBUTIONS
• PRESCRIPTION AND SCORING OF PLANS
• SUMMARY
DVH - WHY DVH

• HUGE INFO TO ASSESS
• QUANTIFICATION IS TOUGH VISUALLY
• DIFFICULT TO UNDERSTAND DOSE AND ANATOMY IN 3D
• DOSE IS A SUUROGATE FOR THE CLINICAL OUTCOME
DVH PROBLEMS

- INSENSITIVE TO SMALL HOT AND COLD SPOTS
- SHAPE OF DVH ALONE CAN BE MISLEADING
- DVH CALCULATED ONLY FOR DEFINED VOI
SO ...........

- QUALITATIVE PLUS QUANTITATIVE
GYNAECOLOGICAL CANCERS

• Cervix
• Endometrium
### Achievable and Acceptable Parameters

<table>
<thead>
<tr>
<th>Volume</th>
<th>Planning Aim</th>
<th>Prescribed Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTV&lt;sub&gt;HR&lt;/sub&gt;</td>
<td>$D_{90}$ EQD2&lt;sub&gt;10&lt;/sub&gt;</td>
<td>$\geq 85$Gy</td>
</tr>
<tr>
<td>BLADDER</td>
<td>$D_{2cc}$ EQD2&lt;sub&gt;3&lt;/sub&gt;</td>
<td>$\leq 90$Gy</td>
</tr>
<tr>
<td>RECTUM</td>
<td>$D_{2cc}$ EQD2&lt;sub&gt;3&lt;/sub&gt;</td>
<td>$\leq 70$Gy</td>
</tr>
<tr>
<td>SIGMOID</td>
<td>$D_{2cc}$ EQD2&lt;sub&gt;3&lt;/sub&gt;</td>
<td>$\leq 70$Gy</td>
</tr>
</tbody>
</table>

**EBRT-45Gy/25Fr/5Fr/WK PLUS HDR BRACHY 6.5GyX4Fr**
STEP WISE PLAN EVALUATION IN OUR DEPT

- ICBT
- ISBT
ICBT
VAGINAL SORBO

Things to watch out for

- Dose: 5.5Gy x 2-4Fr
- Prescription at 5mm from surface
- Length and diameter of the sorbo is individualised.
- Introitus should always be watched out as reactions will be severe if included by mistake.
Things to watch out for

- Dose -3.5Gy\times10Fr or as boost 3.5Gy\times4-6Fr
- Prescription to covering isodose or volume
- Hyperdose sleeve- avoid confluent areas
- Skin -100%should not go as necrosis is a possibility
- Watch for NVB while prescribing
HEAD AND NECK CANCER

- Lip
- Tongue
- Nasopharynx
Things to watch out for

- $3.5\text{Gy} \times 10\text{Fr}$ or $3.5\text{Gy} \times 4-6\text{Fr}$
- Prescription to volume or covering isodose
- Implant will be the volume
- Hyperdose sleeve should be a minimal area with no confluence
- $200\% < 2\text{cc}$
- Away from bone and skin
Things to watch out for

- 3.5Gy x 10Fr or 3.5Gy x 4-6Fr
- Prescription to volume or covering isodose
- Implant will be the volume
- Hyperdose sleeve should be a minimal area with no confluence
- 200% < 2cc
- Away from bone and skin
Rotterdam applicator

Things to watch out for

- Based on external radiation dose
- Or if salvage then appropriate dose
DNR IN HEAD AND NECK CANCER

- DOSE NONUNIFORMITY RATIO

$V_{100}/V_{150} < 0.4$ USUALLY
PROSTATE CANCER
OAR CONSTRAINTS

- Rectum: $D_{2\,cc} \leq 75\,\text{Gy}\,\text{EQD}_2$
- Urethra:
  - $D_{0.1\,cc} = \leq 120\,\text{Gy}\,\text{EQD}_2$
  - $D_{10} \leq 120\,\text{Gy}\,\text{EQD}_2$
  - $D_{30} \leq 105\,\text{Gy}\,\text{EQD}_2$

RECURRENT PROSTATE

- 36 Gy in 6 fractions [44].
- 21 Gy in 3 fractions [45].
- 30 Gy in 2 fractions to peripheral zone after 30–40 Gy external beam [46].
PERSONAL PRACTICE

• HDR 11.5 Gy x 2 fractions
• EBRT 50 Gy / 1.8 – 2.0 Gy / FRACTION

• Max. urethral dose $\leq 125\%$ MPD
• MPD allowed to indent few mm anteriorly
  but still covered by 80\% isodose
• Higher doses to posterolateral portions (anatomic rationale)
  150-200\%
• Rectal dose $\leq 75\%$
## OUR EXPERIENCE

### TOTAL –ICBT-515AND ISBT 298

Brachytherapy 19 (2020) 457e461

<table>
<thead>
<tr>
<th>Region</th>
<th>( D_{90} )</th>
<th>( \text{EQD}_{20} )</th>
<th>( \text{EQD}_{25} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>CTV (_{HR} )</td>
<td>( D_{2CC} )</td>
<td>( \text{EQD}_{2} )</td>
<td>( 76-88\text{Gy} )</td>
</tr>
<tr>
<td>BLADDER</td>
<td>( D_{2CC} )</td>
<td>( \text{EQD}_{2} )</td>
<td>( 66-76\text{Gy} )</td>
</tr>
<tr>
<td>RECTUM</td>
<td>( D_{2CC} )</td>
<td>( \text{EQD}_{2} )</td>
<td>( 62-66\text{Gy} )</td>
</tr>
<tr>
<td>SIGMOID</td>
<td>( D_{2CC} )</td>
<td>( \text{EQD}_{2} )</td>
<td>( 58-62\text{Gy} )</td>
</tr>
</tbody>
</table>
FOR READING

- Brachytherapy 11(2012) 47-52
- Radiotherapy & Oncology 78(2006) 67-77
- Radiotherapy & Oncology 68(2003) 269-276
THANK YOU