INTERSTITIAL BRACHYTHERAPY FOR GYNECOLOGICAL MALIGNANCIES

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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.
RATIONAL

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
  - Transperineal
    - Syed Neblett
    - MUPIT
  - Transvaginal
    - Vienna applicator

Customized

- Free hand

*Ovoids (AP) replaced by interstitial needles (CC)*
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
Vaginal extension not covered? Suitability for Indian patients.
Prototype applicator with the possibility of parallel and oblique needle 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
• Postimplant 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)
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
NOW

• 50 ml of dilute contrast (5 ml in 100 ml saline) in bladder
• 20 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
  → 2nd session – Present disease extent -- HRCTV –
    6.5 Gy X 4

• OAR – Rectum, sigmoid, bladder

• Plan evaluation –
  CTV -- D90, V100, V150
  Rectum, bladder, sigmoid – D.1, D1, D2
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
  Opioids
• 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 III B 7/9 II B 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

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Ambulatory technique
Any questions?