Challenges of Implementation of 3D Image based Brachytherapy for cervical cancer: Tata Memorial Hospital, India Experience.

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Tata Memorial Hospital Cancer Registry (1941-2015)

Significant down staging
Historical Practice of Gyn BT - ICRU 38

- Orthogonal X-ray Based
- Point A Prescription
- ICRU Rectum & Bladder points
Cervical Cancer – Retrospective Analysis
FIGO Stage IB-IIIB (N = 6234 pts)

Overall outcome with radiation improved over time due to refinement in radiation doses especially Brachytherapy


Dr Ketayun A Dinshaw
16.11.1943 – 26.08.2011

1979-1983: 35% at 8 yrs
1984-1987: 45% at 8 yrs
1988-1994: 55% at 8 yrs

P = 0.000
Advances in gynecological Brachytherapy

• Applicator development
  • Intracavitary (IC), Interstitial (IS) & IC+IS

• In corporation of Newer Imaging Modalities
  • CT, MR, PET, etc.

• Advances in Treatment Planning Systems
  • New Optimization algorithms

• Image / Volume Based Brachytherapy
Hurdles in implementation of advances in BT Practice in India / LMICs’ ?

- Cancer Incidence and Mortality
- Heterogeneous Spectrum of Stage
- Lack of infrastructure & disparity
  - Imaging (CT/MR), MR compatible applicators
- Lack of expertise / Research Networks
- Financial and Logistic Issues
- Regulations & Legal Issues
- Ethical / Cultural / Socio-economic issues
Example: Optimal Utilization of CT imaging for BT planning

1st application

Point A: 7.0 Gy
ICRU R: 3.7 Gy / 2cm3 : 3.3 Gy
ICRU B: 2.6 Gy / 2cm3 : 5.6 Gy
Sigmoid (2 cm3) : 4.0 Gy
2\textsuperscript{nd} application

3\textsuperscript{rd} application

4\textsuperscript{th} application
Example: Use of Gold standard Imaging modality at Brachytherapy

Axial

Sag

Coronal

Vagina Involvement = 20 mm (Post)
Treatment planning / optimization

Vienna II applicator
Paucity of trained human resources/ expertise

• Inadequate training and exposure to latest technology!
• Overburden with routine care /competing priorities/multi-tasking.
• Lack of dedicated time & enthusiasm towards Clinical research.
TMH – Medical University Vienna Collaboration: 2008 – 2009
Bilateral Exchange Program
Tata Memorial Hospital Participation in International Multicentric Studies

- Refine treatment standards

- GYN GEC-ESTRO Research Network

A European study on MRI-guided brachytherapy in locally advanced cervical cancer

EMBRACE

(ENDORSED BY GEC ESTRO)

2009 ONWARDS

TATA HOSPITAL CONTRIBUTION TO EMBRACE

100 patients (IIB-IVA)
Comparison of historical controls vs MR BT experience: TMH

study cohort: MR IGABT approach

Historic cohort: conventional BT series (1979-94)

MR Image Based Brachytherapy Beneficial
Logistics: Availability, Cost & Implementation Issues

Figure 2: Comparison of overall progression free survival using log rank test for study cohort and historic cohort [21] for, all patients (A), stage IIB (B), and stage IIIB (C).

Mahantshtetty et al, IJROBP 2017 (in press)
Cost Benefit analysis – MR IGABT

1. Total patients treated annually: 1318 *(assuming only 25% working)*

2. After 5 years the patients alive and without toxicity would have contributed:
   a. 2D Brachy: USD 4.9 million
   b. 3D Brachy: USD 6.1 million
   c. **Gain: INR 7.2 Crores (USD 1.1 million)**

3. Within 5 years these patients would have contributed back almost the entire investment made

Chakraborty et al, Brachytherapy 2017
A phase III randomized trial comparing conventional BT Vs MRIGABT in locally Advanced Cervical Cancer

clinicaltrials.gov Identifier: NCT03005743

Multi-centric Phase III study

Eligible patients - locally advanced cervical cancers (IIB and IIIB) planned for radical Radio(Chemo)therapy

EBRT to Pelvis +/- Chemotherapy (Cisplatin 40mg/m2 weekly)

Randomize

Hypothesis: -10% improvement in Local control rates with MRIGABT

Conventional ICBT

Target accrual: - 700 IIIB - 350 IIB

MR based BT

Started in early 2017: Expected completion 2021

Funding: DAE CTC, Tata Memorial Hospital
CT and MRI correlation: Ongoing Research
Research: TRUS Guided Target Volume Definition

TMH STUDY: ongoing research (N=27 pts so far)

MRI-TRUS Correlation
Thank you for your kind Attention!