EXPERIENCE OF SUNWAY MEDICAL CENTRE WITH IMAGE-GUIDED HYBRID INTRACAVITARY-INTERSTITIAL BRACHYTHERAPY TECHNIQUE (HBT) FOR LOCALLY ADVANCED DISEASE FOLLOWING EXTERNAL BEAM RADIATION IN A CERVICAL CANCER CASE

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BACKGROUND

Radiation therapy is a primary treatment for cervical cancer, with brachytherapy being essential for locally advanced cases. However, parametrial involvement limits the effectiveness of conventional intracavitary brachytherapy, as the Geneva applicator may not adequately cover the high-risk clinical target volume (HR-CTV) while respecting organ-at-risk (OAR) constraints, reducing local control rates. At Sunway Medical Centre, we conducted an observational study on patients treated with image-guided Hybrid Intracavitary–Interstitial Brachytherapy (HBT).

PURPOSE/OBJECTIVE

Aim: To evaluate the dosimetric advantages of HBT over conventional intracavitary brachytherapy in the treatment of locally advanced cervical cancer with residual parametrial involvement.

Objectives:

- To compare the dose coverage of the HR-CTV between intracavitary brachytherapy and HBT.
- To assess the radiation dose received by organs at risk (OARs), specifically the bladder, rectum, sigmoid colon, and bowel for both intracavitary and HBT techniques.

METHODOLOGY

Patient Selection

Diagnosed with stage 1B3 Cervical Adenocarcinoma, Grade 1.

Technique

Interstitial Brachytherapy	Intracavitary-Interstitial Brachytherapy
• Geneva applicator sets (5cm 30 oc intrauterine tube, 20 mm colpostat cap paired)	• Geneva applicator sets (5cm 30 oc intrauterine tube, 20 mm colpostat cap paired) • Proguide round needles and guiding tubes (Positioned at 2D and 2G)

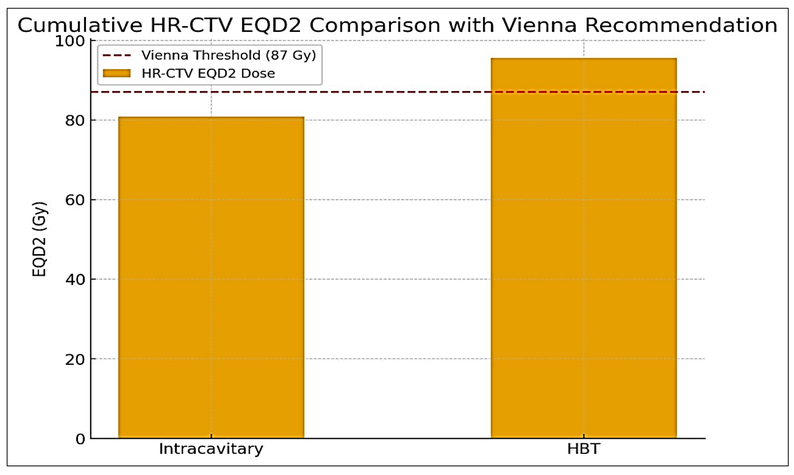
Oncentra Brachy Version 4.5.5

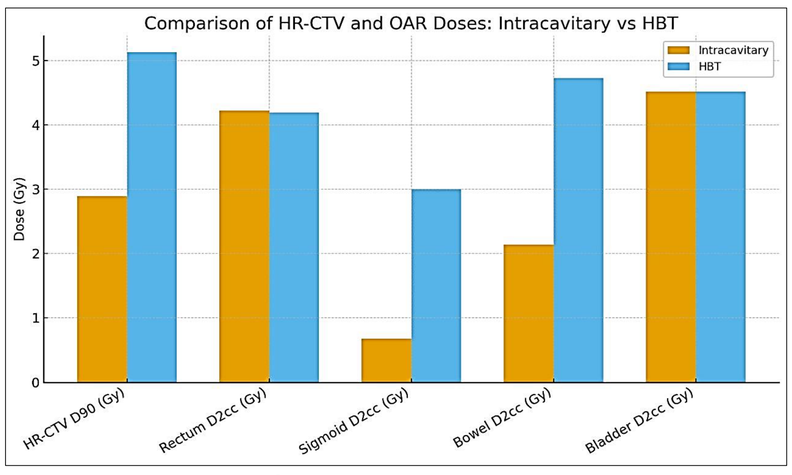
Treatment planning was performed at Oncentra Brachy version 4.5.5 with CT simulation images fused with pre-brachytherapy MRI

Descriptive Analysis

Mean doses received by 90% of HR-CTV	Doses received by 2cc of OARs of bladder, rectum, bowel and sigmoid colon

RESULTS/DISCUSSION





Intracavitary Brachytherapy (ICBT)

- HR-CTV D90 only reached 57.8% of prescribed dose (2.89 Gy).
- Limited tumor coverage, especially in parametrial extension.
- Dose escalation restricted by nearby OARs (rectum and bladder).
- Cumulative HR-CTV EQD2: 80.9 Gy, below the Vienna group threshold (≥87 Gy).

Hybrid Intracavitary–Interstitial Brachytherapy (HBT)

- HR-CTV D90 increased to 73.1% of prescribed dose (5.13 Gy).
- Significantly improved coverage of residual lateral posterior mass.
- Cumulative HR-CTV EQD2: 95.6 Gy, surpassing the Vienna threshold for effective local control.
- OAR doses (rectum, bladder, bowel, sigmoid) remained within acceptable tolerance limits despite higher HR-CTV coverage.

Comparative Insight

- HBT achieves superior dosimetric outcomes compared to ICBT alone.
- Enables personalized adaptive brachytherapy, particularly crucial for patients with residual parametrial disease post-EBRT and chemotherapy.
- Balances tumor control probability with organ-at-risk sparing, optimizing therapeutic ratio.

Clinical Implication

- Supports integration of HBT as standard of care in locally advanced cervical cancer with parametrial involvement.
- Aligns with evidence from the Vienna group and international guidelines promoting combined ICBT–ISBT approaches.

CONCLUSION

Integrated technique of intracavitary and interstitial cervical brachytherapy should be the standard of care for patients with residual parametrial disease post chemotherapy and external beam radiotherapy, given the superior dosimetric coverage rendering into higher local control rates. This form of adaptive brachytherapy is personalized to each individual patient's anatomy in order to lead to the best results.

IMPROVEMENT

Conduct the study with a larger cohort of patients with similar clinical characteristics

- Increase statistical power.
- Allow for meaningful comparisons and subgroup analysis.
- Provide more robust conclusions regarding the efficacy and safety of HBT.

Incorporate long-term follow-up data to assess:

- Tumor response and recurrence rates.
- Acute and late radiation toxicities (especially involving OARs).
- Patient quality of life post-treatment.

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