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Reflections and insights gained from the SCMPCR E-Learning Program (ELP-09) on Brachytherapy Practices for Medical Physicists and Radiation Oncologists - Intracavitary and Interstitial Procedures

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It is my absolute delight to have witnessed the highly successful E-learning program (ELP-09), 2024 on Brachytherapy Practices for Medical Physicists and Radiation Oncologists, conducted by South Asia Centre for Medical Physics and Cancer Research (SCMPCR). Even more overwhelming is that I feel deeply honoured to have been among the privileged nine moderators selected for this esteemed event.

As an Academic in the field of Medical Physics from India, I am eager to share my thoughts and insights about the E- Learning Program (ELP-09). This Program has not only showcased the centre's commitment to excellence in Medical Physics education but has also demonstrated the power of collaborative learning in the digital age..

As we all aware that Gynaecologic carcinomas, including cervical cancer, present a significant burden on low- and middle-income countries (LMICs). Brachytherapy plays an integral role in the treatment of gynaecologic carcinomas, as it is essential for both curative and palliative treatment. Brachytherapy delivers almost half the target dose while relatively sparing the normal tissues compared to external beam therapy. Not only is brachytherapy an essential component of the treatment of cervical carcinoma but also precise well-timed delivery is vital for tumour eradication. However, there are numerous geographic and economic barriers for providing brachytherapy to cancer patients in LMICs.

According to the World Health Organization (WHO) 528,000 women are diagnosed each year with cervical carcinoma and 266,000 women succumb to the disease each year, 90% of them in low- to middle-income countries.¹ In these areas the incidence: mortality ratio exceeds 50% which is the equivalent to 1 life lost every 2 minutes. Even more alarming is that although incidence and death rates are decreasing in high-income countries, cervical cancer deaths are projected to increase by 25% over the next 10 years in low-income countries. The highest rates are in Central and Southern America, East Africa, South and Southeast Asia, and the Western Pacific.

Recent advances in radiation technologies have opened the field to new and promising radiation strategies. However, Training is a critical and often neglected step in implementing such new technology. Most of the errors in brachytherapy treatment delivery are the result of human error, miscommunications, or misunderstanding of equipment operation rather than failure of devices. Therefore, it is imperative that all members of the brachytherapy team are adequately trained. Brachytherapy personnel team training, including problem-oriented/practical learning initiatives and development of standard operating procedures and roadmaps for successful implementation of brachytherapy program is vital.



Recognizing this imperative and to acquaint adequate Theoretical and Practical Knowledge on Brachytherapy Practices, SCMPCR despite physical limitations has created a virtual gateway for Medical Physics education through its E-learning Program (ELP-09) on critical topic “**Brachytherapy Practices for Medical Physicists and Radiation Oncologists - Intracavitary and Interstitial Procedures**” was from November 1st, 2024 to November 22nd, 2024 to enriched with the knowledge and skills in order to move towards efficient techniques and utilize in the clinic for improved cancer treatment. This course included a series of lectures on the specific discipline on Brachytherapy and its recent developments followed by group discussions, and online examinations.

Experienced International faculties from various regions of the world generously shared their expertise and insights in this program. More than 100 participants has been joined to this program from different nations. As the accreditation and certification of Medical physicists are essential for producing a qualified medical physicist (QMP), Keeping this under consideration, SCMPCR E-learning program (ELP-09) provided the participants with 16 continuous professional development (CPD) credits points **accredited by the International Organization for Medical Physics (IOMP)**.

On 1st November, 2024, the E-learning session has started with a keynote address delivered by a visionary Leader Prof. Dr Golam Abu Zakaria, the Chairman of SCMPCR, setting the tone for the event, speaking about the importance of E-learning programs along with addressing the pressing challenges facing by the Medical Physics Society and reaffirming the belief in the transformative potential to shape a more sustainable and equitable world. In the following paragraphs, I will reflect on my experiences thereby highlighting the programs strengths, challenges and key takeaways

Key topics Covered:

Lecture 1: The very first lecture of the session was being delivered on 1st Nov, 2024 by renowned **Prof. Dr. Hasin Anupama Azhari**, Director of SCMPCR and Professor at Centre for Biomedical Science and Engineering, United International University, Bangladesh on the topic “**Introduction of Dosimetric terms & Quantities for Brachytherapy Procedure**” covering the basics of Brachytherapy and its quantities, TG-43 Dose calculation protocols, 3D Dosimetry and its Uncertainties, QA in accurate dose delivery and patient safety that provides a structured methodology to optimize patient safety and treatment outcomes thereby mitigating errors in the workflow.

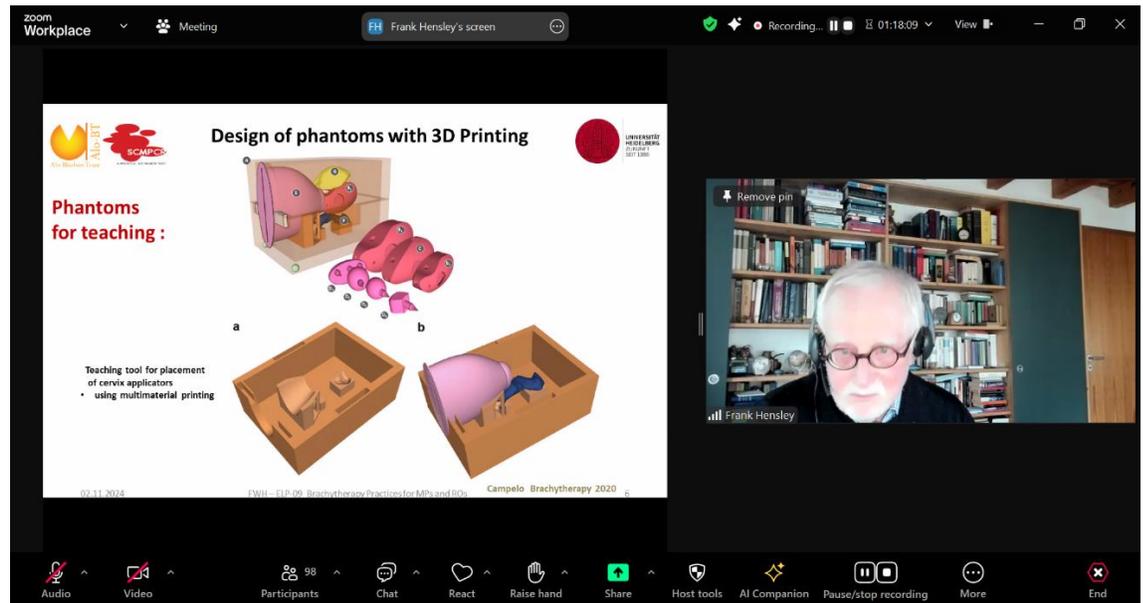
The screenshot shows a Zoom meeting window with a slide titled "AAPM TG 43 algorithm Radial Dose function". The slide content includes:

- Text: "Dose fall-off along the transverse axis of the source (absorption and scatter effects in water)"
- Equation:
$$\dot{D}(r, \theta) = S_k \cdot \Lambda \cdot \frac{G(r, \theta)}{G(r_0, \theta_0)} \cdot g(r) \cdot F(r, \theta)$$
- Equation:
$$g(r) = \frac{\dot{D}(r, \theta_0) \cdot G(r_0, \theta_0)}{\dot{D}(r_0, \theta_0) \cdot G(r, \theta_0)}$$
- Diagram: A schematic of a source of length L and radius r0. A point P(r, theta) is shown at a distance r from the source axis and an angle theta from the normal. The diagram also shows the reference point P(r0, theta0) at a distance r0 and angle theta0. The source radius is labeled r0 = 1 cm.

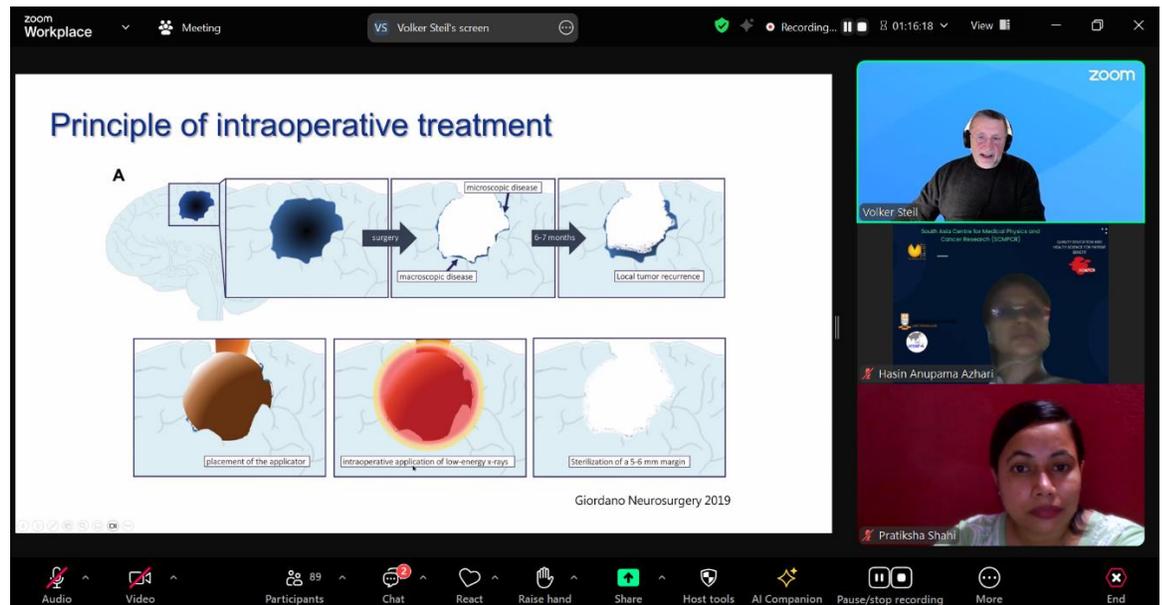
The Zoom interface shows the meeting title "Hasin Anupama Azhari's screen", recording status, and a video feed of the presenter, Prof. Dr. Hasin Anupama Azhari.

Lecture 2: The second lecture was focused on “**Advanced Technique in Brachytherapy**” by **Dr Frank W Hensley**, Retired Medical Physicist from University of Heidelberg on 2nd Nov, 2024, provided an insightful presentation and shedding light on techniques such as combination Intracavitary and interstitial (Hybrid Applicator), Design of individual applicators with 3D Printing, Directionally Modulated Brachytherapy and

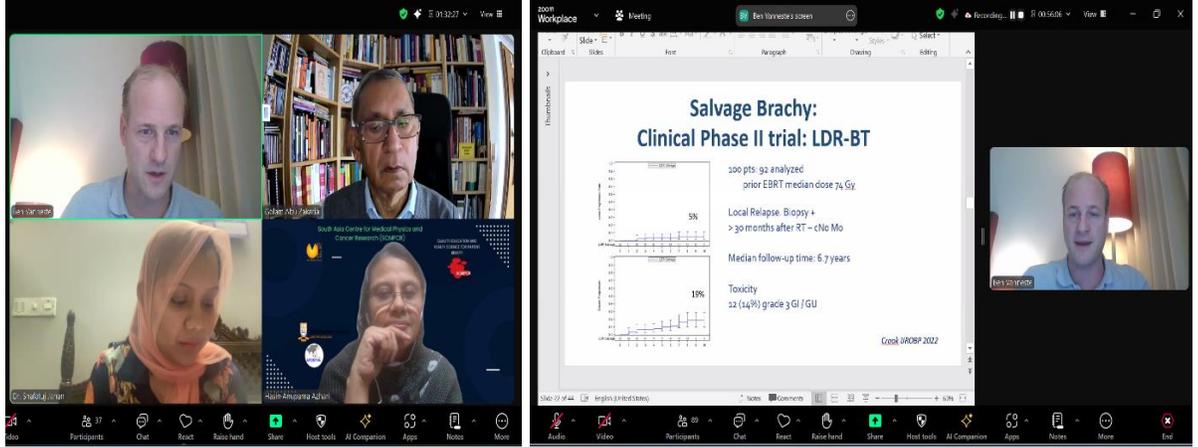
Electromagnetic Tracking in Brachytherapy. The integration of advanced modalities further enhances treatment efficacy.



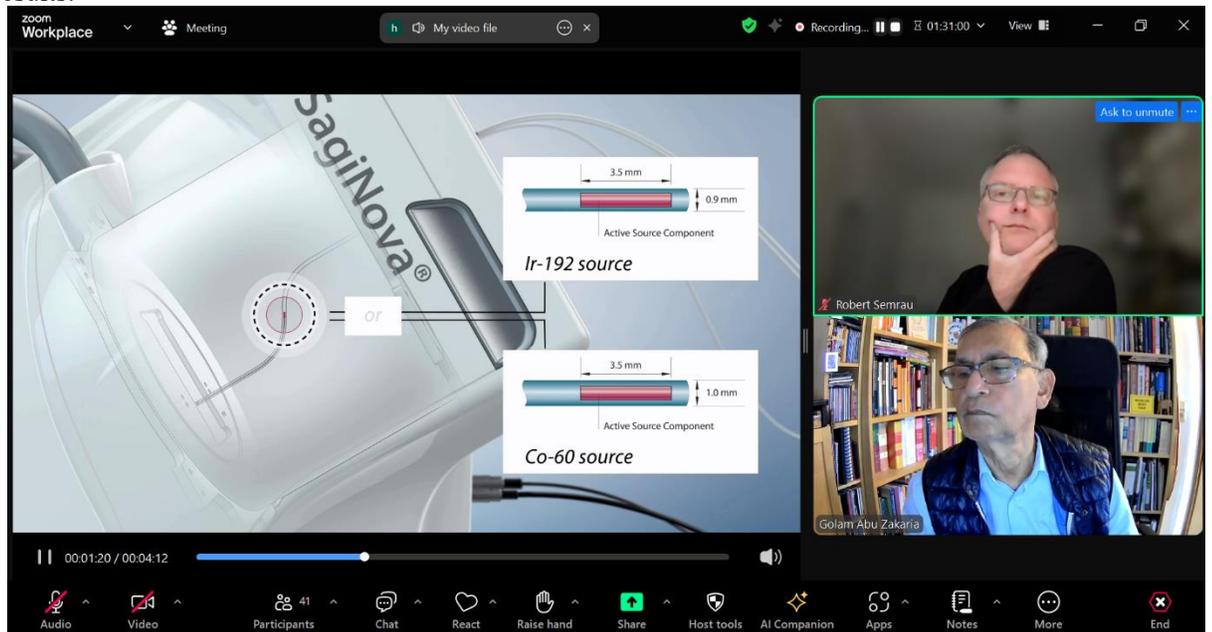
Lecture 3: The third lecture of the session explored on “**Electronic Brachytherapy: Physical Basics and Medical Applications**” by **Dipl-Ing, Volker Steil**, Former Chief Medical Physicist at University Medical Centre, Mannheim on 3rd Nov, 2024 highlighting the advancements in Intraoperative Irradiation with Brachytherapy, Treatment planning System like Kypho IORT and also discuss elaborately about IORT for Brain metastases.



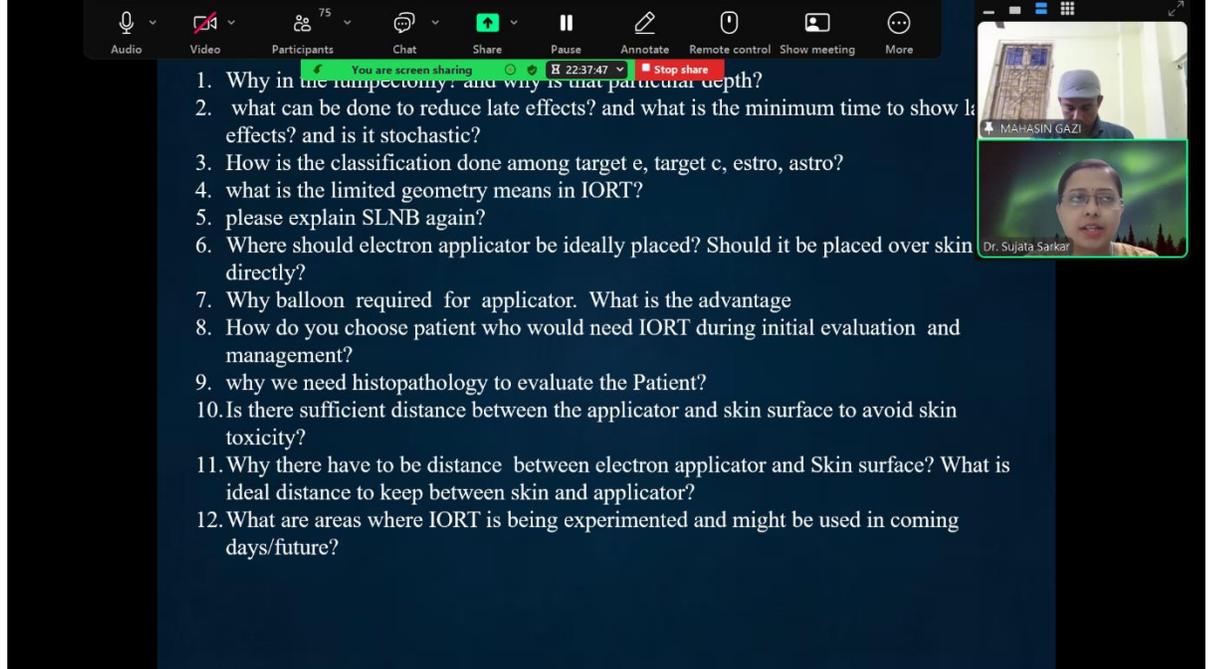
Lecture 4: The fourth lecture of the session delved into the “**Prostate Brachytherapy**” by **Dr Ben Vanneste**, Radiation Oncologist at UZ Ghent, Belgium on 8th Nov, 2024 shared his valuable expertise on Brachytherapy procedure, indications and its clinical results. Overall, this lecture provided valuable insights about the landscape of Prostate Brachytherapy and highlighted the potential to enhance the treatment quality and outcomes.



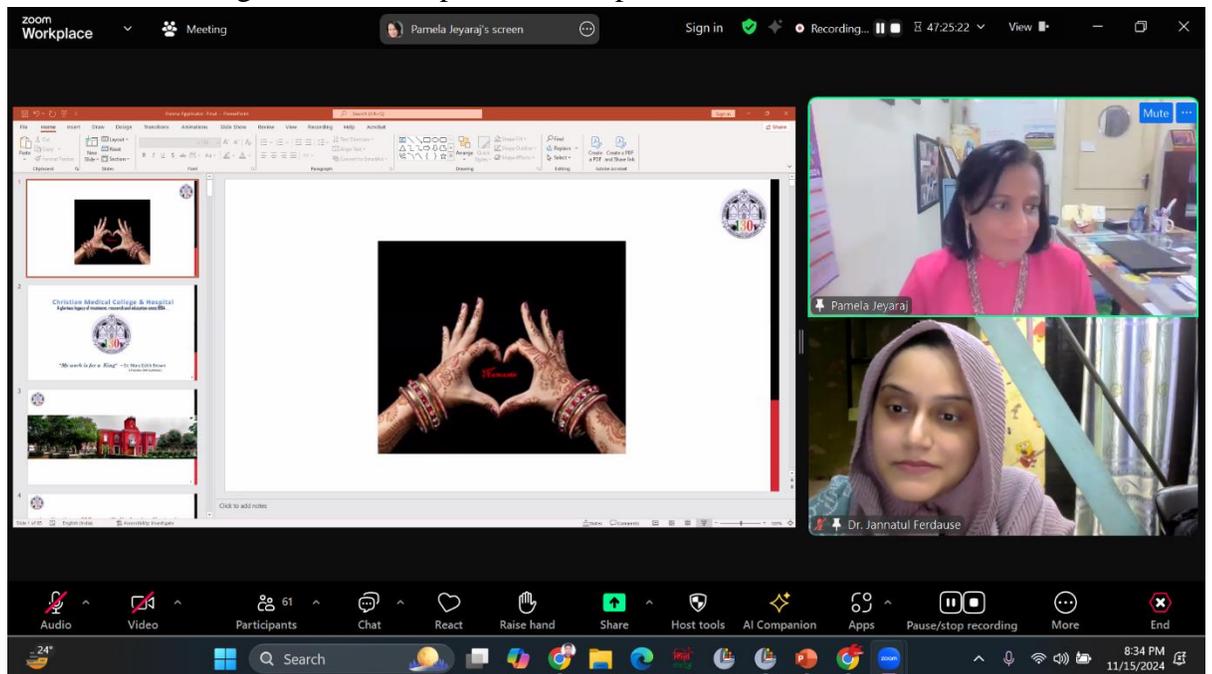
Lecture 5: The fifth lecture of the session provided insights into “**Brachytherapy in Gynaecological Cancer Treatment**” on 10th Nov, 2024 by **Dr Robert Semrau** from Strahlen therapie Bonn-Rhein-Sieg, Germany. The lecture has basically started with the classification of both cervical cancer as well as the Endometrium cancer, treatment methodologies along with chemotherapy and challenges associated with it. Also discussed about the different brachytherapy applicators like Ring tandem, Hybrid applicators for both interstitial and intracavitary ensuring accuracy and safety in delivering radiation, thereby offering thorough knowledge for improved precision. Moreover, the presentation showcased the initial clinical results.



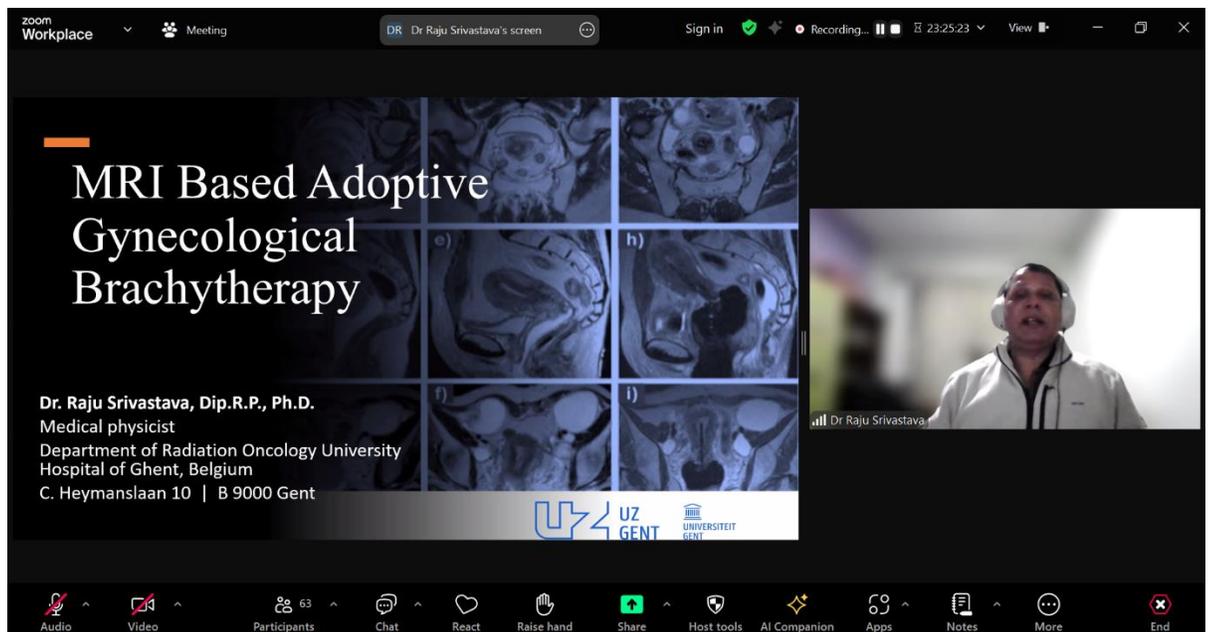
Lecture 6: The sixth lecture of the session was focused on “**Intraoperative Breast Brachytherapy: Implementation and Clinical Considerations**” on 12th Nov, 2024 by **Dr Sujata Sarkar**, Radiation Oncologist and **Mr. Mahasin Gazi**, Medical Physicist from Apollo Hospital, India. The lecture has provided a comprehensive overview of IORT, Clinical procedure, surgical techniques, forward and inverse technique of dose optimization and has also explained on its applications as well as advantages in modern radiotherapy practice for accurate delivery.



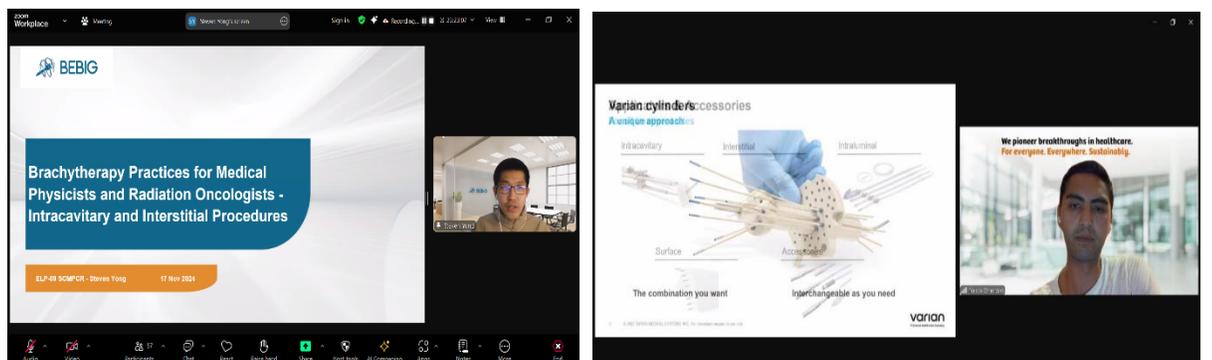
Lecture 7: The seventh lecture of the session explored on “**Application of Vienna/Cylinder applicator in Gynaecological Brachytherapy**” delivered on 15th Nov, 2024 by **Dr Pamela Alice Jeyaraj**, Prof and Head in Christian Medical College, India. The session was thoroughly informative and engaging. The speaker provided comprehensive overview on evolution of Brachytherapy applicators and adeptly outlined the different templates of Interstitial Brachytherapy, Syed-Niblett Template, MUPIT, image guided Brachytherapy and Vienna applicator highlighting how these applicators can be utilized to allow for precise targeting of tumours. Moreover, the technical requirements were explained in a clear and understandable manner, making the complex concepts accessible to all the attendees.



Lecture 8: The eighth lecture of the session was on “**MRI Based adoptive Gynaecological Brachytherapy**” presented by **Dr Raju Srivastava**, Medical Physicist, University Hospital of Ghent, Belgium on 16th Nov, 2024 was informative and impactful. The presenter adeptly navigated through the Target volume Concept, Applicator selection - its capabilities and the advantages offers in Brachytherapy Treatment. The lecture effectively communicated the ICRU 89/GEC-ESTRO recommendation along with some case presentation which allows for precise dose delivery. Through detailed case studies and data analysis, the attendees gained valuable insights into the practical applications and benefits.



Lecture 9: The ninth lecture of the session was being delivered on the topic “**Brachytherapy-Interstitial and intercavitary procedures**” by Industrial Partners both **BEBIG AND VARIAN** on 17th Nov, 2024 provided a comprehensive overview of different the HDR products, Brachytherapy CT/MR Applicator portfolio, Brachytherapy software’s, Treatment Planning Systems and detailing the steps involved and the challenges encountered. Overall, the lecture served a compelling testament to the significance of Brachytherapy procedures in modern radiotherapy practice.



As a participant, I had a great privilege of participating in the SCMPQR E-learning program (ELP-09) 2024, which offered a comprehensive exploration of Brachytherapy principles, specifically tailored for precision radiotherapy techniques. The program’s theoretical sessions provided an in-depth examination of Brachytherapy processes, covering both conceptual and practical aspects.

This experience has been invaluable. Each moment of the program contributed significantly to my professional growth, and I appreciate the opportunity to reflect on the knowledge and expertise gained through this enriching experience. As reviewer, it’s evident that the knowledge and skills gained here will not only enhance our individual capabilities but also empower us to drive positive change within our respective field.

In conclusion of this comprehensive report, I would like to express my sincere gratitude to all the esteemed facilitators and the faculty members for sharing their expertise, guidance, and insights throughout the program. A special thanks to all the co-ordinators especially for Prof. Dr Golam Abu Zakaria, Prof. Dr Hasin Anupama Azhari, Md. Anwarul Islam and other associated members for their tireless efforts, their passion and undying spirit, whose generous support made this E-learning program possible.

Your commitment to professional Development and education is deeply appreciated and has had significant impact on the success of this event. This initiative has demonstrated its commitment to community to enhance accessibility and engagement within the community. Significant efforts are being made to combat the global disparity in access to brachytherapy. International initiatives have been established to provide training and expertise to professionals in LMICs. It is essential to maintain these relationships and continually assess the shifting needs in cancer treatment. Although major human and financial resources are ultimately needed to solve these disparities, these efforts begin at the local level, both here and abroad.

As wrapping up, I want to extend my deepest appreciation to Prof. Dr Hasin Anupama Azhari madam for this incredible opportunity to share my insights and perspectives about the SCMPCR E-learning Program (ELP-09), 2024. This opportunity not only allows me to reflect on my own journey and learnings but also reinforces the importance of collaboration and knowledge sharing within our professional community. As we continue our journey of professional development, looking forward to being part of this community in future again.