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Título de la charla	Uncertainties in dose calculation and measurement in protontherapy

Resumen

Proton therapy has emerged as a highly advanced form of radiotherapy, thanks to the unique physical characteristics of proton beams, particularly the presence of the Bragg peak, enable the delivery of high doses to tumors while minimizing exposure to surrounding organs at risk. However, these advantages come with significant challenges in dose calculation and measurement, making the role of the medical physicist essential throughout the treatment process, but also in the developments of research projects related to clinics.

Accurate dose calculation in proton therapy is complicated by uncertainties related to patient anatomy, tissue heterogeneity, and particularly proton range prediction. Small variations in tissue composition, anatomical changes during treatment, or imaging inaccuracies can lead to significant deviations between planned and delivered dose distributions. Furthermore, advanced treatment techniques such as pencil beam scanning require sophisticated dose calculation algorithms.

Dose measurement and quality assurance also present unique challenges. The steep dose gradients and high sensitivity of proton beams to material composition demand the use of highly precise detectors and measurement protocols. Verification of beam parameters, calibration of dosimetric equipment, and validation of treatment planning systems are critical tasks to ensure treatment safety and accuracy.

Medical physicists play a central role in addressing these challenges. As proton therapy continues to evolve, by integrating advances in imaging, dosimetry, and computational modeling in collaboration with research laboratories, treatment precision and clinical outcomes are significantly improved.