

AbstractID: 4581 Title: Intro: particles and intensity modulation

In the past 15-20 years substantial research and development effort has been put into the optimization of photon beam radiation therapy, primarily into the development of intensity-modulation techniques (IMRT). As far as the development of photon IMRT delivery technology is concerned, we may have almost reached a point of diminishing returns. In recent years novel treatment modalities (other than photons) are gaining more attention, which goes hand in hand with the construction of a number of new proton therapy facilities in this country.

The physical advantage of proton therapy is indisputable, even though it is not always used to its full extent in clinical treatments: The blessing of the finite range of protons goes along with some uncertainty in the position of the steep distal dose gradient region in the patient. This is because the position of the distal gradient is affected by setup errors, internal organ motion, metallic implants, and biological effects, among others. Due to these reasons, the distal gradient is not currently used for dose shaping. The full clinical utilization of the physical advantage of proton therapy also requires beam scanning and intensity-modulated particle therapy (IMPT), which is in clinical use at only two centers.

The clinical benefit of proton therapy has been demonstrated for a relatively limited number of cases, and will be further studied as more proton centers are being brought on line. Of course, the benefit comes at a price. Several investigators now look into novel and potentially cheaper proton acceleration techniques, including laser acceleration, which will be discussed by Dr. Ma, and dielectric wall acceleration.

Outside of the USA the treatment with heavier charged particles, such as carbon ions, has become a topic of great interest, which will be reviewed by Dr. Jäkel. Both the treatment with protons and carbon ions open new avenues for image-guided radiation therapy: Those particle beams activate positron emitters in the patient, which can be visualized with PET scanners and serve as an in-vivo dosimeter, as explained by Dr. Parodi.

Last but not least, there has been renewed interest in lighter charged particles, namely electrons. The talks by Drs. Li and Papiez will show that electrons are a particularly attractive treatment option in combination with IMRT.

Educational objectives:

1. To give a brief update of the state of the art of proton radiation therapy
2. To link the various presentations of this symposium