

PROTON RADIOTHERAPY IN THE TREATMENT OF EARLY LUNG CANCER

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Radiotherapy of early lung cancer has become an accepted method, which achieve excellent local control and satisfactory overall survival of patients. Local control is dose-dependent, as is the risk of acute and chronic side effects. Therefore, it is highly desirable to use methods that allow dose escalation while not increasing the risks of post-radiation toxicity too much. Proton radiotherapy meets this requirement.

Proton radiotherapy uses a beam of accelerated protons, which are characterized by ionization at a certain depth in the tissue and this feature leads to a better dose distribution in comparison with photon techniques. Proton radiotherapy reduces not only the classical parameters (like Dmean lung tissue, V20Gy), but also parameters that are hard to fulfil with photons (eg V5Gy). There is a fundamental difference between proton radiotherapy and modern IMRT techniques.

Compared to photon therapy, proton radiotherapy is more sensitive to the movements of irradiated organs and to changes in their shape and volume. These facts apply even more strongly to pencil beam scanning (PBS) technology. Respiratory movements can be addressed in several ways - using 4D CT and the concept of ITV; a "repainting" strategy, which reduce the risk of an interplay effect; or a deep inspiration breathhold (DIBH) strategy. We consider the DIBH to be optimal.

Proton radiotherapy is used for treatment of NSCLC from stage I to stage IIIB. We consider the use of proton radiotherapy to be more useful for more advanced inoperable cancers in which it is not possible to do curative photon therapy with the delivery of a sufficiently high dose and fulfil dose limits to critical organs. When used in the early stages, proton radiotherapy has a major benefit in larger tumors and in special clinical situations, such as tumors in underlying interstitial lung diseases or re-irradiation.