Range Shifting Helmet

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Technology description

Background Information

Nearly 700,000 people in the United States alone are currently living with a brain tumor. Whether benign or malignant, brain tumors can have permanent physical, cognitive, and psychological impacts on a patient’ s life, and may even result in death. Brain tumor treatments cost significantly more than any other cancer group, with an average annual per-patient cost of well over $100,000. These treatments typically use x-ray beams to target affected areas in the brain. While x-ray beams are effective in treating small, uniformly shaped regions, they can produce significant side effects when used to treat large, irregularly shaped targerts. Proton beams could bring more benefits into stereotactic radiosurgery (SRS) applications due to their superior depth dose properties. However, one issue regarding proton therapy is that the energy generated by current proton accelerators is too high to allow for direct treatment of lesions occurring less than four centimeters below skin.

Technology Summary

Researchers at the University of Iowa have developed a range shifting, helmet-shaped device that enables the treatment of shallow brain lesions. The device is made of a tissue-like plastic that mimics first four to seven centimeters of human tissue when inserted into the radiation beamline. This process reduces the distance between the proton beam range shifting device and the actual skin entry point of the beam, thereby minimizing the dose of radiation delivered to healthy brain tissues outside of the tumor. The ‘helmet’ fits over existing medical head frame structures with high reproducibility and accuracy. This device will be of increasing commercial value as the use of protons in SRS becomes more widespread.

Advantages

· Lowers the energy requirement of the radiation beam to target tissue depths less than 4cm
· Reduces lateral beam size growth by placing helmet within 5cm of all tissue entry points
· Ensures special displacement from original positioning does not exceed .3mm
· Minimizes the amount of radiation delivered to healthy brain tissue outside of the tumor

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