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Predictive models for radio-induced effects after stereotactic radiosurgery (SRS) for uveal melanoma

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Uveal melanoma (UM) is the most common primary intraocular malignant tumour in adults. The mortality is 40-50% in 15years, mainly due to liver metastasis. In the recent decades,conservative techniques able to control the disease while preserving the eye have replaced, when possible, the enucleation.Gamma Knife stereotactic radiosurgery (GKRS) is one of the techniques to perform a conservative treatment of UM, as it can deliver very high doses to the target sparing in the same time to the surrounding tissue, creating a high dose gradient. Several studies have shown that GKRS allows the survival, local control and preservation of the eye. The therapeutic dose for this disease is very high (35 Gy to 50%) and it is necessary that the reference isodose is much larger than the tumour volume identified by the diagnostic exams. Several side effects are obviously associated to an important treatment from dosimetric point of view. Despite the deterioration of vision or complete blindness are often reported in the literature as important side effects and several authors argued that with the optimization of the treatment plan in terms of the prescription dose to the target and absorbed doses to critical structures, the visual function loss may be limited. Now-a-days, in the literature there are still no studies designed to investigate the dose-effect relationship of critical structures of interest with reference to adverse events. The aim of our study was to develop a predictive model for the radio-induced side effects in patients affected by uveal melanoma, treated with GKSR. The adverse effect which focuses the attention of the project is the partial or complete loss of the visual function. The aim is to find predictive dosimetric and/or clinical factors to obtain dose constraints to critical structures. With any external beam radiation therapy, the highest dose of radiation develops where multiple beams intersect. Thus, the fewer beams there are, the greater the dose reaching other areas traversed by the beams. For example, if only 2 beams are used, the highest dose would develop at the site where the beams intersect, but a significant portion of the dose would be distributed to fields anterior and posterior to the intersection. Stereotactic radiosurgery (SRS) uses the above principle to deliver a highly focused ionizing beam so that the desired target is obliterated, leaving adjacent structures nearly unaffected. Guidance is provided by a variety of imaging techniques, including angiography, computerized tomography (CT), and magnetic resonance imaging (MRI). The key to SRS is immobilization of the patient so that targeting can be accurate and precise. Uveal melanoma(UM) could be a life threatening intraocular neoplasm. Gamma Knife Stereotactic Radiosurgery (GKSRS) could be a well assessed strategy for conservative treatment of UM providing sensible results for survival, native management and eye preservation. Despite severe facet effects following GKSRS having been rumored, literature studies designed to analyze dose–effect relationship of essential structures area unit rather poor. Our aim is to develop prophetic models for radio-induced effects in UM patients (pts) treated with GKSRS.The hot particles employed in SRS and SBRT could return from varied sources. The Gamma Knife uses Cobalt-60. Over two hundred finely targeted beams of nonparticulate radiation at the same time encounter at the precise location of the encephalopathy. nucleon beam radiosurgery derives its advantage from the alleged “Bragg peak”, a term that describes the pattern of deposition of nucleon beam radiation. Protons decelerate as they travel although tissue, depositing disproportionately a lot of radiation at bigger depths. The protons deposit most of their energy at their depth of maximal penetration, leading to a “peak” of radiation at that tissue depth. The depth of peak radiation are often exactly outlined by the energy the atom smasher imparts to the nucleon beam.A linear scientific instrument, or LINAC, creates photons by fast electrons on a linear path wherever they touch a metal target. This produces one, intense gauge boson beam. to scale back the result of the radiation on adjacent healthy tissues, a moving frame is employed to focus on the abnormality with “arcs” from completely different directions. accelerator treatments is also given in multiple sessions over many days, that area unit observed as fractionated irradiation. With fractionated irradiation, radiation is delivered to the growth or lesion at completely different points within the cellular division cycle. this might be the well-liked kind of treatment in some circumstances. Fractionated treatments could continue for up to thirty days. “Hypo-fractionated” treatments area unit given over five to eight treatment days.Precise stereotactic localiza-

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tion is important for treatment of intra-cranial structures, as a result of their deep location and since of the shut proximity of significant structures within the brain. throughout irradiation administration, the bone are often utterly immobilized employing a frame.Fractionated stereotactic irradiation (FSRT) involves multiple low-dose radiation treatments. Fractionated stereotactic irradiation is employed to treat tumors in hard-to-reach locations or with terribly uncommon shapes. Fractionated stereotactic irradiation is additionally wont to treat tumors that area unit set in shut proximity to very important structures, like the second cranial nerve or neural structure, wherever even a awfully correct high-dose single fraction of stereotactic radiosurgery couldn't be tolerated.

For this procedure, patients area unit needed to wear a special made-to-order covering material helmet. (For alternative stereotactic radiation techniques of the pinnacle, the patient's head should be immobilized in an exceedingly special headring frame, that is applied beneath local anaesthetic.) once the patient undergoes the same old stereotactic imaging like CT or MRI, little doses of radiation area unit accurately applied day by day. The made-to-order covering material helmet harnesses the patient whereas receiving low, daily doses. Fractionated stereotactic irradiation is additionally a wonderful thanks to administer radiation treatments to infants or babies whose invasive brains cannot tolerate customary radiation. Within the past, oncologists were restricted to treating infants and tiny youngsters with therapy alone. This method additionally shows nice promise within the treatment of benign tumors like pituitary adenomas or meningiomas. the utilization of fractionated stereotactic irradiation permits glorious management of the growth however spares the brain from such psychological feature side-effects as impaired noesis and memory that unremarkably occur with customary radiation treatment.Stereotactic radiation is also used in extra-cranial sites, in a procedure called stereotactic body radiation therapy (SBRT). A body frame has been designed to immobilize patients for such treatment. In addition, frameless methods of administering SBRT to the body have been developed. These frameless systems rely on skeletal landmarks or implanted fiducial markers to locate and guide the therapy beam to treatment targets within the body.

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