4129 POSTER

Parotid Gland Irradiation During Craniospinal Plus Boost Treatment of Pediatric Brain Tumours − a Dosimetric Evaluation

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Background: Previously, we reported radiation exposure of parotid gland during whole-brain radiotherapy (WBRT). Cranial portion of conventional craniospinal irradiation (CSI-brain) portals encompasses WB plus lower cervical spine. This portal design suggests more parotid gland volume could be involved in CSI-brain portals than in WBRT portals. The authors investigated the dosimetric exposure of the parotid gland during CSI plus brain boost (BB) RT for pediatric brain tumours.
Patients and Methods: Sixteen pediatric brain tumour patients who underwent conventional CSI were selected for this retrospective study. PTV for CSI-brain is the same as in WBRT with the exception of an extended inferior field to encompass the lower cervical spine. Parotid gland volumes were newly delineated on existing plans. Treatment plans were generated for each patient to have a pair of conventional RT and intensity-modulated radiation therapy (IMRT) for CSI-brain. Brain volume plus 5 mm margin and spinal canal with margin was delineated as PTV for IMRT. IMRT plans were constructed using uniform optimization constraints using 6-MV photons. Comparative dose-volume histograms were generated for each patient and analyzed. The threshold of radiation-induced xerostomia was defined as a mean parotid dose (parotid D_{mean}) of 25 Gy in this study.
Results: Primary tumours were localized to brain stem (one), pineal gland (one), supratentorial (three), and infratentorial (11) regions. Conventional parallel-opposed CSI-brain portals exposed 89±7.4% of total parotid volumes. Prescription dose was 55.0±1.46 Gy (31.9±6.9 and 23.1±6.3 Gy for CSI-brain and BB, respectively). Parotid gland received 89.1±5.9% of the prescription dose for CSI-brain, regardless of tumour locations. Dose contribution from BB comprised 1.65±1.3% and 33.3±8.6% of prescription dose was delivered to parotid gland (from supra- and infratentorial tumours, respectively). Parotid D_{mean} was 34.3±7.4 Gy (25.5±5.2 and 37.2±5.4 Gy with supra- and infratentorial tumours, respectively, p = 0.003). Fourteen patients (87.5%) received more than 25 Gy of parotid D_{mean}. The two patients with parotid D_{mean} <20 Gy had supratentorial tumours. IMRT plans for 16 patients decreased the parotid D_{mean} to 17.2±4.1 Gy.
Conclusions: These data suggest that the parotid gland receives a considerable amount of radiation dose during conventional CSI. Special cautions may be needed to spare the parotid gland, especially those patients with infratentorial brain tumours. IMRT planning can be one practical mechanism to reduce the parotid gland dose in these selected patients. Further study to evaluate the clinical implications on parotid dose is currently ongoing.

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Ovarian Germ Cell Tumours in Children

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Background: Ovarian GCT are rare pediatric malignancies with known good prognosis. The aim this study was evaluation of single centre results.
Methods: We retropectively evaluated all histologically proven ovarian GCT in 11 years time period- from January 2000 till December 2010.
Results: In the group of 21 patients median age was 10 years (1−17 y.). The most frequent sign was abdominal pain caused by ovarian torsion (in 8; 36.3%) followed with urgent surgery. Time to diagnosis was longer in benign tumours (11 weeks vs 4.3 w. in malignant tumours).
Most patients were stage I (15; 71%), st.II were 3, st.III 3 pts. Histologically were confirmed 12 matture teratomas, 2 immature TE, 2 dysgerminomas, 1 teratoblastoma, 1 yolk sac tumour, 2 mixed GCT.
Most patient underwent surgical unilateral salpingo-oophorectomy (17), in 1 patient was performed bilaterally. In 3 pts was ovarian-sparing tumorectomy performed.
Surgical treatment as the sole therapeutic modality was adequate in 13 pts, in 8 was subsequent chemotherapy administered. We observe tumour reccurence in 2 patients. All girls but one are alive, followed up between 4 and 125 months after treatment.
Conclusion: Our results are in concordance with published data. With "watch and wait" strategy in st. I and cisplatinum based chemotherapy in advanced stages we observed low reccurence rate (9.5%) and high cure rate (mortality 4.7%).

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Treatment for Head and Neck Ewing's Tumour/Rhabdomyosarcoma With Helical Tomotherapy in Paediatric and Young Adult Patients − Initial Clinical Experience and Comparison to 3DCRT

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Background: Ewing's sarcoma and non-eyelid/orbital rhabdomyosarcoma of the head and neck are considered prognostically unfavorable. Local disease management is difficult but highly conformal radiotherapy might improve the chances of uncomplicated local control.
Materials and Methods: From 2007 to 2010, 5 children and young adults ages 4−19 were diagnosed with Ewing's sarcoma of the C-spine (2), parapharyngeal space (1), temporal bone (1), or nasopharyngeal rhabdomyosarcoma (1) (all biopsy proven). The median greatest tumour diameter was 60 mm, and all had intracranial and/or intraspinal extension. Patients were treated with induction chemotherapy followed by definitive radiation using helical tomotherapy (HT). Clinical treatment plans were produced using the TomoTherapy Hi-Art® TPS. These 5 cases were re-planned a posteriori using Varian Eclipse® to achieve the best clinically acceptable 3D conformal plan (3DCRT) with constraints to critical organs at risk (OARs) equivalent to the original HT plans. The following parameters were used for comparison assessment between with HT and 3DCRT: volume of PTV receiving 95% dose $(V_{95\%RX})$, Homogeneity Index: $(D_{2\%}-D_{98\%})/D_{50\%}$, median dose to PTV $(D_{50\%})$, $V_{2\,Gy}$, and dose to OARs including the optic nerves, optic chiasm, spinal cord, brainstem, hippocampi, cochleae and parotid glands.
Results: The patients were treated to total doses of 50.4–55.8 Gy, 1.8 Gy/fraction over 42−53days. $V_{95\%RX}$(PTV) was 98.1% (89.7–100) for HT compared to 85.7% (63.9–99.5) for 3DCRT. Homogeneity Index averaged 0.04 (0.025–0.07) on HT compared to 0.14 (0.07–0.28) for 3DCRT. $D_{50\%}$ was 54.2 Gy for HT compared to 53.1 Gy for 3DCRT. The average $V_{2\,Gy}$ was 2917 and 2293cc on HT and 3DCRT respectively. The dose limiting structures were typically the spinal cord for spine cases (max $D_{2\%}$ accepted: 53.5 Gy) and optic structures (D_{max}: 54.7 Gy) for base of skull tumours. These maximum doses were similar with both techniques since the same constraints were used for 3DCRT planning. For paired organs, contralateral sparing was possible using HT without compromising on PTV coverage. With short follow up (3−24months), we have observed no local recurrence.
Conclusion: HT offers highly conformal IMRT plans with better coverage, more homogeneity and higher median dose to PTV than 3DCRT plan, but at the expense of an increased low dose exposure. Clinically the therapeutic ratio appears to favour HT, even for young patients at higher risk of low dose radiation-induced late effects.

4132 POSTER

NMYC-Amplified Neuroblastoma Succumb to Treatment With a Polyamine Analogue

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Background: Neuroblastoma is a childhood cancer of the sympathetic nervous system and it is the most common solid and deadly extra cranial malignancy of children. Neuroblastoma with amplified NMYC has a poor prognosis and new treatment strategies are needed. We investigated the effect of treating human neuroblastoma cell lines with the polyamine analogue PG-11047, which has been studied in clinical Phase I and Phase II studies in the US for treatment of solid adult cancer.
Material and Methods: The human neuroblastoma cell lines were chosen due to their different genetic backgrounds; SH-SY5Y has wild type *p53*, IMR-32 has wild type *p53* and *MYCN* amplification, while LA-N-1 has mutated *p53* and *MYCN* amplification. Cells were treated for 3 treatment cycles with 10 mM PG-11047. One treatment cycle consisted of a 3-day period of treatment followed by 6 days of cultivation in drug free medium. Cell proliferation was monitored for all 3 treatment cycles. Colony formation in soft agar was studied and Western blot was used for investigating protein expression.
Results: During the first treatment cycle all cell lines were sensitive to PG-11047 treatment as demonstrated by decreased colony formation in soft agar, with IMR-32 being the most sensitive line and LA-N-1 the least sensitive. During subsequent treatment cycles, IMR-32 cells and LA-N-1 cells died with were no cells remaining to be analyze. However, SH-SY5Y cells appeared to develop resistance to PG-11047 treatment.