Particle therapy and IMRT for patients with esthesioneuroblastoma: a single-institution experience

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Purpose/Objective

Esthesioneuroblastoma, also known as olfactory neuroblastoma, is a rare tumor entity originating from the olfactory neuroepithelium. There is only few data about the efficacy of different treatment strategies so far. Several approaches have been made and a combination of radiation and surgery is thought to be effective. Most tumors are situated in the nasal cavity and thus applied radiation therapy (RT) should be very precise. Intensity modulated radiotherapy (IMRT) and carbon ion radiotherapy (CIRT) are highly precise techniques with advanced dose conformity and improved sparing of organs at risk which might translate into improved local control and moderate radiation induced toxicity.

Material/methods

The retrospective analysis contained 17 patients with esthesioneuroblastoma (Kadish stage ≥ C: 88%; n=15). 4 patients initially presented with cervical lymph node metastasis and 4 patients already underwent a previous RT. The treatment consisted of either IMRT (n=5) or CIRT (n=4) or a combination of both techniques (n=8). Applied median doses were 60 Gy in 30 fractions (IMRT only), 51 Gy (RBE) in 17 fractions (CIRT only) and 52 Gy in 26 fractions as well as 21 Gy (RBE) in 7 fractions (bimodal RT). Overall survival and local control rates were determined after a median follow-up of 13 months (range: 1-72 months). Acute toxicity was evaluated up to three months after completion of the radiotherapy according to CTCAE criteria (Version 4.03).

Figure 1: dose distribution of a patient with an esthesioneuroblastoma in the nasal cavity. Radiation therapy was performed in a bimodal setting consisting of (A) IMRT (50 Gy in 25 fractions) and a boost scheme with (B) carbon ion radiotherapy (24 Gy [RBE] in 8 fractions). The PTV is delineated in red. Organs at risk are delineated separately.

Figure 2: Follow-up of a patient with an esthesioneuroblastoma in the sphenoidal sinus and nasal cavity. The tumor shows an uptake of the contrast agent. A MRI-scan before radiation (June 2015). B MRI-scan after radiation (March 2017): stable disease.

Results

Local recurrence-free survival and overall survival rates were 92% after a follow-up of 6 months (n=12/13) and 88% after a follow-up of 12 months (n=7/8). One patient died 5 months after the treatment. Local recurrence occurred in another patient after 36 months who died 26 months later. Both of these patients belonged to the group who underwent a previous RT before. 14 of 16 patients (88%) are still alive and recurrence-free so far. One patient has been lost to follow-up. Grade I toxicity (100%; n=17) and grade II toxicity (65%; n=11) were frequently observed. The most common toxicities were nasal and/or oral mucositis (76%; n=13) and radiation dermatitis (82%; n=14). Only one patient (6%; n=1) developed a grade III toxicity (hyposmia).

Conclusion

Considering the advanced tumor stage of the cohort the results showed good local control and overall survival rates in short term follow-ups. Our results show that IMRT, CIRT or a combined approach seem to be a feasible and effective treatment in esthesioneuroblastomas without leading to severe acute treatment-related side effects. Further follow-up will be needed to investigate the benefit of CIRT.