

**Including anatomical variations in robust optimization for head and neck proton therapy can reduce the need of adaptation**

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1 **Corrigendum to “Including anatomical variations in robust optimization for head and**  
2 **neck proton therapy can reduce the need of adaptation” [Radiother. Oncol. 131 (2019)**  
3 **127-134]**

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24 The authors regret the occurrence of minor errors in the their published article [1]. The work  
25 compares the anatomical robustness of three different planning strategies for head and neck  
26 proton therapy by the analysis of weekly and total cumulative dose distribution considering  
27 anatomical changes throughout the treatment course by means of weekly control CTs.

28 It was stated in the original manuscript that the patient data were selected from 20 subsequent  
29 patients with locoregionally advanced HNSCC that received IMRT treatment at our institution  
30 between January and July 2016. The corrected description of patient data used in our in-silico  
31 study is that datasets from 20 locally advanced HNSCC patients were included, 17 of whom  
32 were treated with IMRT, 2 with double scattered (DS) proton radiotherapy and 1 with a mixed  
33 (IMRT/DS) treatment at our institution between August 2015 and July 2016. This changed  
34 patient data description does not affect the presented data.

35 It was written in the original manuscript that the PTV-based treatment plans (PTVb) could not  
36 account for anatomical changes in 10 cases. The number must be corrected to 12. This  
37 correction does not change the general rating of anatomical robustness of the three investigated  
38 planning approaches as the classical robust optimization (cRO) and the anatomical robust  
39 optimization (aRO) could not account for anatomical changes only in 5 cases and 1 case,  
40 respectively.

41 Within this corrigendum, the authors would furthermore like to clarify and correct some  
42 misleading statements for the organ at risk (OAR) doses. (1) It was stated that doses to the  
43 OARs remained below the constraints in the nominal plans. Actually, this is only correct for  
44 the planning OARs, defined as the OAR volumes outside the CTV, but not for the total OAR  
45 volumes whose dose statistics were given in Table 1. The authors would like to add for  
46 clarification that the nominal plans could not meet the dosimetric constraints for the total OAR  
47 volumes in several cases for the ipsilateral parotid gland (9×PTVb, 8×cRO, 8×aRO), the larynx  
48 (8×PTVb, 9×cRO, 8×aRO) and the pharyngeal constrictor muscles (17×PTVb, 18×cRO,  
49 18×aRO). (2) The original manuscript reported the increase of the larynx mean dose in the

50 cumulative dose distributions, and stated that the remaining OAR dose parameters presented  
51 no major deviations between the nominal and cumulative doses. This statement referred just to  
52 the change of the median values given in Table 1. The authors would like to specify that the  
53 mean increase of the investigated dose parameter in the cumulative compared to the nominal  
54 dose distribution was always  $< 1.3$  Gy. However, major deviations with increases of more than  
55 5 Gy occurred in individual cases for the mean dose of the larynx ( $2 \times \text{PTVb}$ ,  $2 \times \text{cRO}$ ,  $2 \times \text{aRO}$ ),  
56 the ipsilateral parotid gland ( $1 \times \text{PTVb}$ ) and the esophagus inlet muscle ( $1 \times \text{PTVb}$ ). The presented  
57 original article focussed on the investigation of target coverage loss when analyzing the  
58 anatomical robustness of the three planning approaches and the authors did not consider the  
59 increase of OAR dose parameters as an indication for potential plan adaptation. Thus, the  
60 reported corrections to the original manuscript do not change the major findings and drawn  
61 conclusions.

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#### 64 **References**

- 65 [1] Cubillos-Mesías M, Troost EGC, Lohaus F, Agolli L, Rehm M, Richter C, et al.  
66 Including anatomical variations in robust optimization for head and neck proton  
67 therapy can reduce the need of adaptation. *Radiother Oncol* 2019;131:127–34.  
68 doi:10.1016/j.radonc.2018.12.008.