

学位論文抄録

Three-dimensional conformal radiation therapy; experimental and clinical investigations
(3次元原体照射に関する基礎的および臨床的研究)

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Abstract of the Thesis

Purpose: To evaluate value of 3D-CRT based on multimodality-imaging.

Materials and Methods: (Investigation I) We performed phantom study with 6 spheres filled with FDG to obtain 3 source-to-background ratios (SBRs). The ratio to maximum intensity at 5% intervals was applied as the threshold for contouring. The ratio between contoured- and actual volumes (volume ratio) was calculated, and the threshold ratio was selected to provide a volume ratio close to 100%. (Investigation II) We evaluated multimodality-imaging-based gross tumor volume contouring with FDG-PET/CT fused images of 20 head-and-neck squamous cell carcinoma (SCC) patients. The GTV of the primary tumors was designed by two independent observers. GTV1 and GTV2 were designed with conventional and multimodal imaging, respectively. For geometric interobserver comparison, we calculated the concordance rate as the ratio of the intersection ($A \cap B$) of the GTVs to their union ($A \cup B$). Intermethod (GTV1 vs. GTV2) and interobserver (A vs. B) differences were assessed. The interobserver concordance rates for GTV1 and GTV2 were compared. (Investigation III) We evaluated 38 patients with portal vein tumor thrombosis (PVTT) of HCC treated by multimodality-images-based-3D-CRT. GTV contouring was based on images of contrast-enhanced CT, MRI, and FDG-PET. The total dose was translated into a biologic effective dose (BED) of 23.4-59.5 Gy₁₀ (median 50.7 Gy₁₀) as the α/β ratio=10. Predictive factors were evaluated for tumor response and survival.

Results: (Investigation I) Threshold ratios ranged from 25 - 80%; they were higher for smaller spheres ($p = 0.003$) and lower SBRs ($p < 0.001$). (Investigation II) The 95% limits of interobserver agreement were narrower for GTV2 than GTV1. The mean interobserver concordance rate for GTV2 was higher than for GTV1 (54.5% vs. 39.1%, $P = 0.0002$). (Investigation III) The response rate was 44.7%. The PVTT size (<30 mm vs. ≥ 30 mm) and BED (<58 Gy₁₀ vs. ≥ 58 Gy₁₀) were significant factors for tumor response. The median survival was 9.6 months. The Child-Pugh classification (A vs. B) and BED were significant factors for survival.

Conclusions: GTV contouring should not be conducted with single modality images alone. Multimodality-imaging provides complementary information and objective GTV contouring. Higher RT dose provides better clinical outcomes of patients with HCC-PVTT. Therefore, dose escalation by multimodality-images-based-3D-CRT is essential for RT.