Comparison of $^{201}$Tl-chloride SPECT with $^{99m}$Tc-MIBI SPECT in the depiction of malignant head and neck tumors

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Objective: Comparison of $^{201}$Tl chloride SPECT (Tl-SPECT) with $^{99m}$Tc-MIBI SPECT (MIBI-SPECT) in the depiction of malignant head and neck tumors was prospectively studied. Methods: Forty-one patients with various tumors of the head and neck were included in this prospective study. Histologically, 36 patients had squamous cell carcinomas, 3 undifferentiated carcinomas, 1 transitional cell carcinoma, and 1 MALT lymphoma. All patients underwent a simultaneous dual-isotope SPECT of the head and neck with $^{201}$Tl and $^{99m}$Tc-MIBI. Dual-isotope SPECT for early ($n = 41$) and delayed acquisition ($n = 21$) was performed. Qualitatively, 3 observers evaluated both Tl-SPECT and MIBI-SPECT individually. The interpretation criteria were graded as grade 1 (no abnormal increased uptake) to 5 (definitely increased uptake of a degree equal to or greater than that of normal salivary gland). Statistical analysis of the comparison of Tl-SPECT and MIBI-SPECT was performed. The interobserver difference was evaluated using the $\kappa$-coefficient. Quantitatively, T/N ratio (the ratio of the counts in the tumor divided by that in the normal nuchal muscles) and retention index were compared between Tl-SPECT and MIBI-SPECT. Results: On both the early and delayed images, the grades of uptake of the tumor in Tl-SPECT were significantly higher than those in MIBI-SPECT by three observers. The grade of Tl-uptake of the tumor on the delayed images was 5 for all observers ($\kappa$-coefficient = 1); however, the $\kappa$-coefficient varied from 0.39 to 0.84 in early Tl-SPECT, and in early and delayed MIBI-SPECT. Statistical differences in T/N ratio were noted between early Tl-SPECT (2.87 ± 1.19) and MIBI-SPECT (2.48 ± 1.06), and between delayed Tl-SPECT (2.11 ± 0.70) and MIBI-SPECT (1.20 ± 0.48). The retention index of Tl-SPECT (0.81 ± 0.24) was significantly higher than that of MIBI-SPECT (0.52 ± 0.15). Conclusions: The present study qualitatively and quantitatively showed that $^{201}$Tl had higher accumulation in the tumor than $^{99m}$Tc-MIBI in both early and delayed images.

Key words: head and neck neoplasms, $^{201}$Tl chloride, $^{99m}$Tc MIBI, SPECT