ORIGINAL ARTICLE

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Evaluation of mandibular invasion by head and neck cancers using ^{99m}Tc-methylene diphosphonate or ^{99m}Tc-hydroxymethylene diphosphonate and ^{201}Tl chloride dual isotope single photon emission computed tomography

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Whether a patient with head and neck cancer has mandibular invasion or not is important in determining the method of resection surgery. But, no modality is adequately reliable when used alone in the evaluation of mandibular invasion. Therefore, to more accurately diagnose mandibular invasion in head and neck cancer, we used a new modality, namely, ^{99m}Tc methylene diphosphonate (MDP) or ^{99m}Tc hydroxymethylene diphosphonate (HMDP) and ^{201}Tl chloride dual isotope single photon emission computed tomography (Tc/Tl SPECT). The aim of this study is to disclose the usefulness of Tc/Tl SPECT in the assessment of mandibular invasion by head and neck cancers. ^{99m}Tc-MDP or -HMDP SPECT (Tc SPECT)s and ^{201}Tl chloride SPECT (Tl SPECT)s were performed in 34 patients with suspected mandibular involvement of head and neck cancer. Thirty of 34 cases underwent both Tc/Tl SPECT and CT examination. Tc/Tl SPECT fusion images were obtained using the Automatic Registration Tool (ART, TOSHIBA, Japan) system. In the diagnosis of mandibular invasion on Tc/Tl SPECT fusion images, a problem was that the range of Tc and Tl uptake was changed by the condition of display used in the reconstruction and expression of the images. Then, prior to clinical evaluation, to reveal the most appropriate upper window level for display, a phantom study was performed. In a clinical study, the upper window level was set at 40 or 50%, which were verified to be the proper values in the preliminary study. The diagnostic accuracy obtained using Tc SPECT, Tc/Tl SPECT and CT was compared with the histopathological findings. Tc/Tl SPECT at 40 and 50% upper window level had higher specificity, accuracy, and positive predictive value (73.3%, 85.3%, 81.8%) than Tc SPECT alone (21.4%, 67.6%, 64.5%) and higher sensitivity and negative predictive value (94.7%, 91.7%) than CT (70.6%, 72.2%) for detecting mandibular invasion. Tc/Tl SPECT was a useful diagnostic procedure for the assessment of mandibular invasion by head and neck cancers.

Key words: mandibular invasion, head and neck tumor, ^{201}Tl chloride, SPECT, fusion image