ORIGINAL ARTICLE

Annals of Nuclear Medicine Vol. 17, No. 2, 91–98, 2003

Quantitative evaluation by Tl-201 scintigraphy in the diagnosis of thyroid follicular nodules

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We examined the diagnostic capability of a quantitative evaluation by determining the optimum area for comparisons with nodule and optimum imaging time by Tl-201 scintigraphy in thyroid follicular nodules, retrospectively.

Ninety-one thyroid follicular nodules, for which the pathological diagnosis had been established, were examined (60 benign, 31 malignant). After 74 MBq of Tl-201 chloride was injected intravenously, Tl-201 scintigrams were obtained at 10, 20, 30, and 120 min. For the quantitative evaluation, the area with the greatest accumulation in the nodule and a comparative region in the contralateral thyroid and the soft tissues in the cervical region were manually selected as the region of interest (ROI) referring to Tc-99m pertechnetate scintigrams and ultrasonographic findings as a guide by two radiologists, and the T/N ratio (tumor/normal tissue ratio) and T/S ratio (tumor/soft tissue ratio) were calculated. The pixel counts were determined for all ROI. A summary index of overall test performance can be calculated as the area under the receiver operating characteristic (ROC) curve (Area (Az)), and the likelihood ratios were also calculated. We estimated the cut-off on a fitted binormal ROC curve. Multiple regression analyses were used to investigate the relationships between the optimum quantitative evaluation and 5 independent variables. A p value below 5% was considered to be significant.

The T/N ratio and T/S ratio were significantly higher in the malignant group at 10 min (0.844 and 0.702), 20 min (0.844 and 0.704), 30 min (0.841 and 0.670), and 120 min (0.887 and 0.733), respectively ($p < 0.01$). The Az for the T/N ratio was greatest at 120 min. The multiple regression analysis showed that only 'benign or malignant' was a significant variable in the T/N ratio at 120 min. It correlated significantly in interobserver ($r = 0.80$) and intraobserver ($r = 0.80$) studied ($p < 0.001$). An assessment of the cut-off value of the T/N ratio at 120 min, at the cut-off of 1.255, the likelihood ratio for positive test result was greatest at 8.56, while at the cut-off of 1.010, the likelihood ratio for negative test result was lowest at 0.165.

The T/N ratio at 120 min was more useful than the other condition to distinguish between benign and malignant thyroid follicular nodules.

Key words: thyroid nodules, follicular nodules, Tl-201 scintigraphy, receiver-operating characteristic (ROC) curve