

Thallium-201 scintigraphy in bone and soft-tissue tumors: a comparison of dynamic, early and delayed scans

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Objective: It has been reported that delayed scan of thallium-201 (^{201}Tl) scintigraphy is useful for differentiating malignant tumors from benign lesions and for evaluating treatment response. However, physiological muscle uptake which usually increases in delayed scans, often makes it difficult to evaluate ^{201}Tl uptake and its washout in bone and soft-tissue tumors. The purpose of this study was to evaluate whether the delayed scan is necessary and whether a dynamic scan is useful in the evaluation of bone and soft-tissue tumors. **Methods:** We studied 175 cases of bone and soft-tissue tumors (malignant 45, benign 130). Dynamic scans were acquired every 5 seconds for 10 minutes after ^{201}Tl injection, and time activity curves (TACs) were generated by adaptive smoothing methods. Early and delayed scans were acquired at 10–15 minutes and 2 hours after injection. ^{201}Tl images were visually interpreted and the radioactivity count ratio (T/N) of tumors to normal tissues and washout rate [WR = (early T/N – delayed T/N)/early T/N] were defined. **Results:** When there were no ^{201}Tl uptake in dynamic (n = 67) and early scans (n = 68), no tumor uptake was also appreciated in delayed scans, and all but two cases of negative scans were benign. In 107 lesions, although there were significant differences in T/Ns between malignant and benign lesions both on early scans (2.84 ± 1.45 vs. 2.05 ± 1.13 , $p < 0.05$) and delayed scans (2.17 ± 1.03 vs. 1.58 ± 0.64 , $p < 0.05$), there was a substantial overlap. The T/Ns decreased in delayed scans (i.e., WR > 0) in 100 of 107 cases due to increase of surrounding muscle uptake, and there was no difference in WR between malignant tumors and benign lesions (0.21 ± 0.14 vs. 0.19 ± 0.14). **Conclusions:** For evaluating bone and soft-tissue tumors, delayed scan had little clinical usefulness and it may be time consuming. Dynamic scan would be useful for demonstrating the differences between tumor blood flow and ^{201}Tl uptake in tumors.

Key words: bone tumor, soft-tissue tumor, thallium-201, dynamic scan, delayed scan