Retrosternal goiter is a major diagnostic consideration in evaluation of an anterior mediastinal mass, accounting for approximately 1% of all mediastinal masses. Scintigraphy with thyroid specific radiopharmaceuticals plays an important role in diagnosis of patients with a retrosternal goiter. Here, we report on a case of retrosternal goiter that was demonstrated more clearly by 123I scintigraphy than other imaging modalities, such as conventional contrast-enhanced computed tomography, 99mTc pertechnetate scintigraphy, and 18F FDG PET/CT.

A 56-year-old female visited our hospital for further evaluation of an anterior mediastinal mass discovered incidentally. She had a history of near-total thyroidectomy due to a non-toxic nodular goiter and has been receiving thyroid hormone replacement. Result of a thyroid function test showed a mild hyperthyroid profile with serum T3 of 2.56 ng/mL, free T4 of 1.40 ng/dL, and thyroid-stimulating hormone of 0.21 uU/mL. Conventional contrast-enhanced computed tomography demonstrated a large highly enhancing mass (5.6 cm × 4.3 cm) with multiple small calcifications (Fig. 1A). The 18F FDG PET/CT image showed diffusely increased FDG uptake in the anterior mediastinal mass, and maximum standardized uptake value of the uptake was 3.0 (Fig. 1B). Scintigraphy with 5mCi 99mTc pertechnetate showed only faint mediastinal activity, without definitely characterizing the mediastinal mass (Fig. 1C). Scintigraphy with 5mCi 123I performed 24 h after tracer administration showed intense tracer uptake in the remnant thyroid tissue at anterior neck and the mediastinal mass (Fig. 1D). The patient was diagnosed as having a retrosternal goiter based on findings on chest CT and 123I scintigraphy and under regular surveillance.

Ectopic thyroid tissue is the result of a failure or abnormal embryologic migration of the thyroid anlage. The 18F FDG PET/CT is widely used for evaluation of the malignant nature of mediastinal masses. However, increased FDG uptake can also be demonstrated in various benign lesions, including a retrosternal goiter, non-invasive thymoma, and teratoma. The innate ability to trap iodine and produce thyroglobulin is shared by normal and ectopic thyroid tissues; therefore, ectopic thyroid tissue can be visualized on scintigraphy using thyroid specific radiopharmaceuticals, such as 123I, 124I, 131I, or 99mTc pertechnetate. Enhanced expression of sodium-iodide symporter, which actively mediates iodide transport into the thyroid follicular cells, is a key mechanism of tracer uptake in functioning thyroid tissue. The radiiodine represents both uptake and organisation of iodine in thyroid tissues. 99mTc pertechnetate can be trapped as an iodine analog in the tissue at the early phase; however, it is not organified for synthesis of thyroid hormone. For use in confirmation of ectopic thyroid tissues, radiiodines are biologically more preferred than 99mTc pertechnetate as agent by their higher thyroidal accumulations and the higher gamma energies (159 keV of 123I, 364 keV of 131I, and 140 keV of 99mTc, respectively). Although 131I is cheaper, with greater availability than 123I, it has disadvantages of poor imaging characteristics due to the too high gamma energy and high radiation burden to patients by concomitant beta ray and long half-life. Therefore, we would recommend 123I scintigraphy as the first nuclear medicine imaging study for evaluation of a retrosternal goiter.
Figure 1. Conventional contrast-enhanced computed tomography demonstrated a large highly enhancing mass (5.6 cm x 4.3 cm) with multiple small calcifications (A). The $^{18}$F FDG PET/CT image showed diffusely increased FDG uptake in the anterior mediastinal mass, and maximum standardized uptake value of the uptake was 3.0 (B). Scintigraphy with $^{99m}$Tc pertechnetate showed only faint mediastinal activity, without definitely characterizing the mediastinal mass (C). But, scintigraphy with $^{123}$I performed 24 h after tracer administration showed intense tracer uptake in the remnant thyroid tissue and the mediastinal mass (D).

Conflict of interest

The authors declare no conflict of interest.

References

