

Parathyroid localization with four-dimensional computed tomography (4D-CT) in hyperparathyroidism

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Introduction and Objectives

Traditionally, preoperative parathyroid localization relied on Sestamibi scanning and ultrasonography which are known to have limited sensitivity for multigland disease. In recent years, four-dimensional computed tomography (4D-CT) has been increasingly used for preoperative parathyroid localization in hyperparathyroidism as a promising first-line investigation with higher sensitivity particularly for multigland disease. We aim to review the performance of 4D-CT for localization of parathyroid lesions and their CT characteristics.

Materials and Methods

This is a retrospective study of patients with hyperparathyroidism who had undergone 4D-CT and surgery for final pathology from Oct 2016 to Nov 2018. Reference standard was the intra-operative findings and final pathology of parathyroid adenoma/hyperplasia. Successful complete parathyroidectomy was confirmed with subsequent hypocalcaemia on follow-up. The parathyroid lesions were classified into 1 of 3 relative enhancement patterns, Type A, B and C (Fig. 1). Morphological characteristics including cystic component, polar vessel sign and calcifications were noted. Calcifications were thought to be rare in parathyroid lesions and more suggestive of thyroid lesion instead.

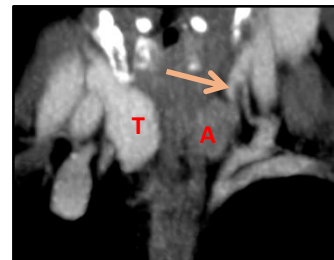
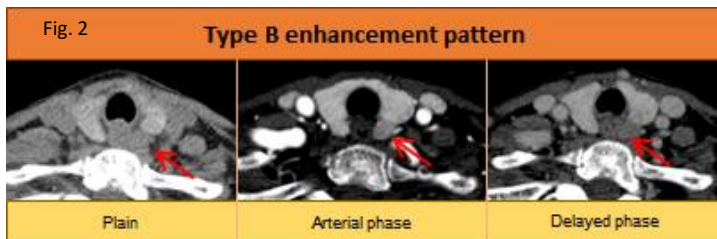
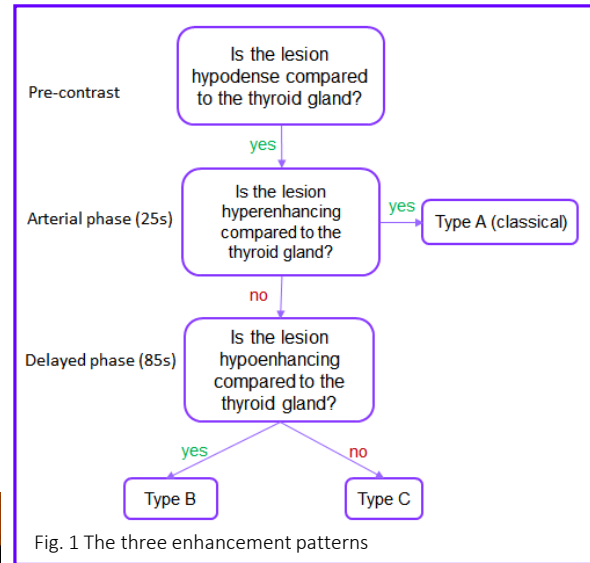


Fig. 3 Polar vessel sign (coronal)

A- adenoma
T- thyroid
Arrow- polar vessel

Results

Total of 9 patients had 29 parathyroid lesions:

- 100% post-operative hypocalcaemia
- 93% sensitivity with 2 false negatives. A parathyroid lesion was accurately localized in the quadrant but was inaccurately described due to a large cystic component.
- **90% had Type B pattern of enhancement** (Fig. 2)
- **70% had polar vessel sign** (Fig. 3)
- 14% had cystic component (Fig. 4)
- 10% showed intralesional calcifications

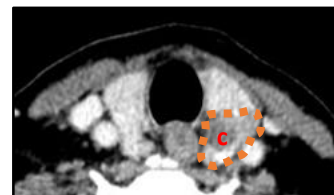


Fig. 4 Cystic change (axial)

Orange line- parathyroid adenoma
C- cystic component

Conclusion

4D-CT demonstrates **high sensitivity** (>90%) in detecting parathyroid lesions in hyperparathyroidism and accurate localization in our study. The most prevalent enhancement pattern was Type B. Polar vessel sign and cystic components are useful radiological features to help localizing the parathyroid gland. The presence of intralesional calcification does not allow reliable differentiation between thyroid and parathyroid lesions.