A 64 year-old female presented with persistent primary hyperparathyroidism after undergoing two previous neck explorations for a suspected parathyroid adenoma. Twelve days after her most recent neck exploration, her parathyroid hormone level remained elevated and a four-dimensional computed tomography (4D CT) of the neck and upper chest was performed. The CT examination demonstrated early dense arterial phase enhancement and contrast washout within an 8 x 8 x 10 mm nodule immediately posterolateral to the left aspect of the esophagus at the level of the T3 vertebral body highly suspicious for an ectopic parathyroid adenoma. (Figures 1 and 2) Following recovery from the most recent surgery and confirmation of a persistently elevated parathyroid hormone level, the patient was taken back to the operating room for targeted exploration of the area seen on 4D CT.

An extensive dissection in the left paratracheal tissues behind the common carotid artery revealed a soft tissue mass that was removed. Frozen section confirmed parathyroid adenoma. The estimated weight of the adenoma was 389 mg. Parathyroid hormone levels were monitored during the case and demonstrated an appropriate response after resection. One third of the adenoma was used for autotransplantation in the forearm. The autologous autotransplanted parathyroid tissue was then removed approximately six weeks later after her calcium and parathyroid hormone levels remained normal.

DISCUSSION

Improvements in imaging localization of parathyroid adenomas in patients with primary hyperparathyroidism (PHPT) prior to surgical excision have allowed the transition from a traditional bilateral neck exploration to selective excision of an adenoma localized pre-operatively. The newest techniques of minimally invasive parathyroidectomy require precise pre-operative localization to be successful.1 The current modalities used for routine pre-operative imaging localization of a parathyroid adenoma primarily consist of nuclear medicine (NM) sestamibi scans with or without cervical ultrasound (US). The two modalities are complimentary as the nuclear medicine scan offers functional information while US demonstrates more detailed anatomic information.

Despite improvements in US and NM technology, neither modality will detect all parathyroid adenomas. A recent meta-analysis demonstrated Tc-99m sestamibi scanning outperformed ultrasound with respective sensitivities of 88% versus 78% for single adenomas. Sensitivity for detection of multiple adenomas was sub-
and 92% respectively for precise localization of occult parathyroid adenomas when prior surgery or localization with US and sestamibi NM scans have been unsuccessful. We showed fair to excellent interobserver reliability across all pairs with an overall excellent reliability. In addition, we demonstrated that adenomas demonstrate a characteristic contrast enhancement pattern of early enhancement. This enhancement was significantly different at the 30 and 60 second phases compared with the progressive enhancement pattern demonstrated in normal lymph nodes.

Given that the majority of parathyroid adenomas will be found using a combined US and NM imaging algorithm, 4D CT should not be used in the standard work-up. However, 4D CT will localize a majority of adenomas successfully in patients where conventional imaging is unsuccessful. While 4D CT may offer improved localization in the routine work-up of primary hyperparathyroidism, the increased radiation dose should limit 4D CT to problem-solving cases.

In summary, parathyroid adenomas in patients with unsuccessful localization on conventional imaging can be accurately demonstrated pre-operatively on 4D CT. Parathyroid adenomas demonstrate characteristic rapid enhancement which can help differentiate these lesions from lymph nodes. Precise localization is critical to minimizing surgical morbidity, particularly in patients who have undergone prior surgery.

REFERENCES


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Disclosure of Financial Interests

The authors and/or their spouses/significant others have no financial interests to disclose.

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