Clinical note

Contribution of intraoperative scintigraphy to the detection of intrathyroidal parathyroid adenoma

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Abstract

The intrathyroidal parathyroid adenomas (IPA) are an infrequent cause of primary hyperparathyroidism and their location makes an appropriate surgical excision difficult.

We present the case of a patient diagnosed with parathyroid adenoma by presurgical scintigraphy in which finally during the parathyroidectomy, the lesion location was intrathyroidal.

We consider that intrasurgical parathyroid scintigraphy with 99mTc-MIBI by portable gammacamera is very useful in parathyroid adenoma excisions and essential in the case of IPA.

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Introduction

Intrathyroidal parathyroid adenomas (IPA) represent 3–4% of all parathyroid adenomas and they are the second cervical ectopia in frequency, after over descended lower glands. The prevalence is higher in persistent or recurrent hyperparathyroidism where it has reached a prevalence of almost 30%.1

Due to an embryological migration disorder, the adenoma becomes enveloped by thyroid tissue, making it necessary, therefore, to remove a portion or the entire thyroid lobe.

Its location makes its surgical access difficult, especially when conventional imaging techniques (ultrasound, scintigraphy) are negative.

Intraoperative scintigraphy with a portable gammacamera (PGC) is very useful in parathyroid adenoma localization. We report the case of a patient with a parathyroid adenoma of intrathyroidal localization.

Case report

A 56-year-old woman diagnosed with normocalcemic hyperparathyroidism and with hypothyroidism being treated with levothyroxine.

Laboratory tests showed total protein values of 6.9 g/dl, phosphate 2.8 mg/dl, calcium 10.3 mg/dl, ionic calcium 1.3 mmol/l and PTH 105 pg/ml.

The cervical ultrasound study showed a thyroid gland of normal size with a single, isoechoic solid nodule of 14 mm × 11 mm × 16 mm in the mid-upper third of the right thyroid lobe, without pathological findings in the theoretical location of the parathyroid. A diagnostic ultrasound-guided FNA of the thyroid nodule was performed, resulting in colloid nodule.

A parathyroid scintigraphy with 99mTc-sestamibi was performed at another hospital with static planar images obtained at 10 and 120 min after tracer injection, including the cervical and the mediastinum areas in the study, that showed tracer uptake persistence in the upper pole of the right thyroid lobe consistent with a parathyroid adenoma presence in that location (Fig. 1).
Fig. 1. Preoperative parathyroid scintigraphy. (A) Early image with thyroid uptake predominantly in the right lobe. (B) Late image suggestive of right parathyroid adenoma.

The patient, with a diagnosis of right upper parathyroid adenoma, was referred to our Center for its surgical removal. We planned a minimally invasive parathyroidectomy (MIP) by standard protocol using intraoperative scintigraphy with a portable gamma camera (Sentinella®) after administration of 5 mCi of 99mTc-MIBI before the start of surgery.

During surgery, images were obtained 15 min post-injection of the tracer (Fig. 2) which revealed an area of increased uptake in the upper pole of the right thyroid lobe, although, the parathyroid adenoma could not be located initially at this level.

Suspecting an intrathyroidal location, via intraoperative palpation, right lateral views of the thyroid territory were performed while stretching the thyroid gland outwards (Fig. 2B), getting detection of an increased uptake area corresponding to a parathyroid adenoma of intrathyroid localization (Fig. 2C).

Subsequently, the surgeon performed a right hemithyroidectomy which included the adenoma. The scintigraphic image of the surgical bed confirmed no uptake in the area of the right thyroid lobe (Fig. 2D). The definitive histopathological confirmation was of intrathyroidal parathyroid adenoma with intense lymphocytic follicular infiltrate. Intraoperative PTH level determinations showed a clear decrease between pre- and post-removal, 78 and 42 pg/ml, respectively.

Fig. 2. Intraoperative scintigraphy with portable gamma camera. (A) 15 min after tracer injection, showing increased uptake in the upper region of the right thyroid lobe. (B) Upper view of intraoperative scintigraphy realization with stretch maneuver of the gland toward the outside. (C) Uptake corresponding to an intrathyroidal parathyroid adenoma. (D) Image after removal of the piece.
Discussion

The IPA is the second most common cause of persistent hyperparathyroidism, after intrathyroidic adenomas, constituting 3–4% of all parathyroid adenomas, and being very uncommon case of carcinomas. In embryologically, the parathyroid glands originate from the 3rd and 4th branchial pouches and after a caudal migration they reach their final position. Inadequate migration can result in anomalous location, such as an intrathyroidal location. The right thyroid area is the most frequently reported (70.6%).

Several publications support MIP as a surgical technique that reduces both intraoperative time and complications, as well as the occurrence of postoperative hypocalcemia, as opposed to using a bilateral neck exploration. Moreover, they extensively describe the advantages of using radioguided surgery in MIP, the most important ones being the smaller amount of damage as a result of the surgery (an incision of about 2 cm), a shorter time in surgery, a faster patient recovery, better cosmetic results and a lower overall cost.

The parathyroid scintigraphy with 99mTc-sestamibi, previous to surgery and the intraoperative detection, with both probe and PGC, has contributed to the development of MIP.

From the scintigraphic point of view, the detection of an adenoma is based on the slow washing of tracer from the abundant number of mitochondria present in the adenomatous tissue that shows a high avidity for the radioisotope. Its sensitivity and specificity have been published at 80–100% and 90%, respectively, and with a low percentage of false negatives. The systematic use of SPECT or SPECT-CT further improves the results in the location of the lesion. Other imaging modalities (ultrasound, CT, MRI), however, present low sensitivity for the detection of parathyroid adenomas although, for example, it has been described that the combination of ultrasound and scintigraphy with SPECT-CT imaging can be useful in the preoperative diagnosis of IPA.

It is important to follow strict criteria when selecting the patients who can benefit from radioguided MIP, among them is having a diagnosis of primary hyperparathyroidism, and a single parathyroid adenoma with significant uptake of 99mTc-MIBI. Invariably, a pre-surgical scintigraphy with 99mTc-MIBI should be performed in all patients, along with SPECT or SPECT-CT imaging, if possible, since they are especially useful in cases of ectopias. One of the limitations, in our case, was the absence of SPECT imaging in the scintigraphy performed at another Center before surgery.

There is previous experience in the realization of the adenoma parathyroidectomy by MIP in the usual location with the help of radioguided surgery. There is, however, a greater surgical difficulty when the lesion has not been located by the standard imaging techniques that are usually performed. Moreover, there are very few publications that prove the utility of intraoperative scintigraphy in these cases.

Although a previous parathyroid scintigraphic study with 99mTc-MIBI can be useful for the diagnosis of IPA, in daily clinical practice of is difficult to treat patients with the absence of an adenoma, even in those cases where SPECT imaging is performed.

In our case, the clinical suspicion, obtained by intrathyroidal palpation as well as the realization of intraoperative scintigraphy with PGC, gave us the diagnosis of an intrathyroidal location of the adenoma. This was confirmed by a later anatomo-pathological analysis of the surgical piece.

In our opinion, currently it must be performed always a preoperative 99mTc-MIBI parathyroid scintigraphy and planar images, and SPECT or SPECT-CT imaging whenever possible, in order to get the parathyroid adenoma’s location. Afterward a minimally invasive radioguided parathyroidectomy, using a gamma probe and portable gammacamera, should be performed, requiring close cooperation between Surgical and Nuclear Medicine Departments.

References