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Case Report Open Access

Radio-guided Surgery of a Patient with Secondary Hyperparathyroidism: The Clinical Impact on the Duration of Surgery in Renal Failure Patient

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Abstract

Secondary hyperparathyroidism is consequent to a chronic hypocalcaemic condition that can be caused primarily by renal failure. As a result of continuous stimulus to produce and secrete PTH induces parathyroid gland hyperplasia. In this case report, we present a chronic renal failure patient with high parathyroid hormon level suspected for secondary hyperparathyroidism. According to the parathyroid scan findings four glands were demonstrated concordant with parathyroid pathology and the patient was operated with intra- operative gamma probe in a very short time. Radio-guided surgery of this renal failure patient by using intra-operative gamma probe for excision of hyperplastic parathyroid glands and hereby shortening the surgery time, provided a positive impact of renal residual function of this dialysis patient. Although, radioguided surgery with minimal invasive surgery is commonly recommended for primary hyperparathyroidism with single adenoma, we recomment radioguided surgery of hyperplastic parathyroid glands especially in renal failure patients for maintaining renal residual function.

Keywords: Parathyroid scintigraphy; Gamma probe; Secondary hyperparathyroidism

Introduction

Secondary hyperparathyroidism is consequent to a chronic hypocalcaemic condition that can be caused primarily by renal failure. As a result of continuous stimulus to produce and secrete PTH induces parathyroid gland hyperplasia. In this case report, we present a chronic renal failure patient with high parathyroid hormon level suspected for secondary hyperparathyroidism. According to the parathyroid scan findings four glands were demonstrated concordant with parathyroid pathology and the patient was operated with intraoperative gamma probe in a very short time. Radio-guided surgery of this renal failure patient by using intra-operative gamma probe for excision of hyperplastic parathyroid glands and hereby shortening the surgery time, provided a positive impact of renal residual function of this dialysis patient. Although, radioguided surgery with minimal invasive surgery is commonly recommended for primary hyperparathyroidism with single adenoma, we recomment radioguided surgery of hyperplastic parathyroid glands especially in renal failure patients for maintaining renal residual function.

Case Report

A 27-year-old chronic renal failure patient with high parathyroid hormone level was sent to our department for preoperative localisation of any multiglandular parathyroid hyperplasia or tertiary adenoma. The patient had a history of chronic renal failure resulting from chronic glomerulonephritis and had been receiving haemodialysis (HD) for six years. Although, he was on a medication of active vit D3 with a dose of 2 ug per day and Cinecalced with a maximum dose of 180 mg/day for six months, his response to treatment was not as expected. Despite the medical theraphy his parathyroid hormone, calcium and phosphore level were 2107 pg/ml (normal, 15 to 65), 11.35 mg/dl (normal, 8.5 to 10.7) and 8.02 mg/dl (normal, 2.7 to 4.5), respectively. His urine output volume was 300 cc. Ultrasonography imaging of the neck was reported as normal. Dual-phase or washout parathyroid scintigraphy both with planar and SPECT acquisition was performed following intravenous injection of 740 MBq Tc-99m MIBI. Static images were acquired in a 128x128 matrix using low energy, high resolution, parallel hole collimator on dual-headed gamma camera (Siemens Medical Solutions, E-cam). Early (post-injection 15 min.) and delayed (postinjection 2 hour) images were obtained at least 5 minutes. Early and delayed planar images were inspected visually. The initial planar images revealed two areas of increased tracer accumulation inferior to the right and left thyroid lobes (Figure 1-white arrows). Two focal areas of increased uptake, and relative progressive increase over time compatible with hyperfunctioning parathyroid glands were detected. SPECT study acquired immediately following planar images using 128x128 matrix 25 s/per projection, and SPECT processing was performed by filtered-back projection using a low pass filter without atenuation correction. SPECT imaging was performed following the static acqusition for additional lesions. SPECT images gave information about the correct positions of the hyperfunctioning two glands (Figure 2). In addition to these glands, SPECT images illustrated two additional small sized glands concordant with parathyroid hyperplasia. Smaller areas of increased tracer accumulation were seen in the upper left and right thyroid lobes. No abnormal tracer was seen in the mediastinum. According to the parathyroid scan findings four hyperfunctioning glands were demonstrated concordant with parathyroid hyperplasia. At the day of the planned operation, 37 MBq Tc 99m MIBI was injected intravenously and the neck region that the two focuses seen

on static images were signed with a pencil through the skin. At surgery, a gamma-detecting probe was used to detect and remove the parathyroid glands. During the operation four glands were detected easily with intra-operative hand-held gamma probe and dissected in 30 minutes. On the second day after surgery, the patient's calcium value was 6.72 mg/dl, his phosphorus level was 3.78 mg/dl, and his PTH level was 24.3 pg/ml. All parathyroid tissue had nodular chief cell hyperplasia. There were no adenomas. His urine output volume was 300 cc postoperatively.

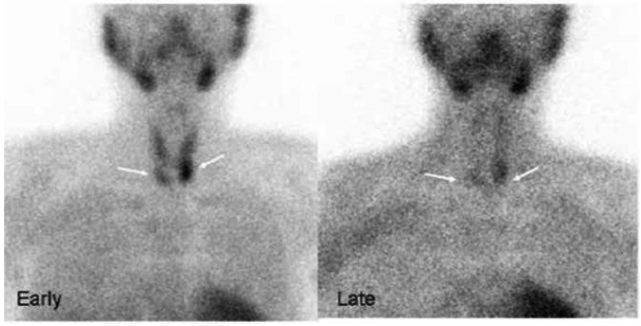

Figure 1: Static early and late images demonstrate two focuses in the inferior pole of left and right thyroid gland.

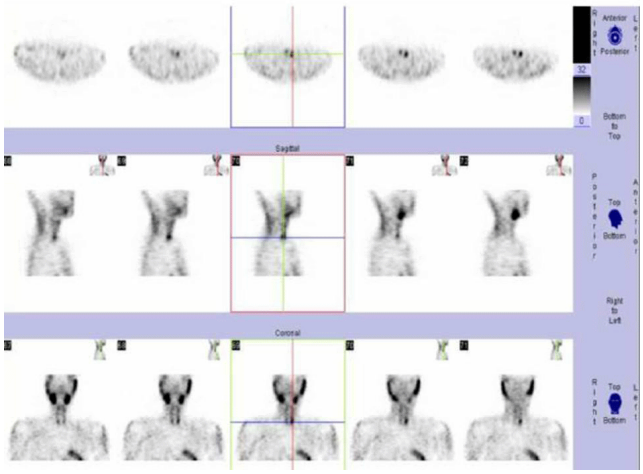

Figure 2: SPECT images illustrate two additional focuses in the supero-posterior aspect of both thyroid glands.

Discussion

Secondary hyperparathyroidism is a frequent complication especially in HD patients. Surgical success depends on the presence of unsuspected supernumerary glands. Dual-phase or washout parathyroid scintigraphy both with planar and SPECT acquisition exploits the different washout timing. Dual-phase parathyroid scintigraphy is an imaging method base on the different washout timing of radiotracers from thyroid and parathyroid tissue. This method was introduced for the first time by Taillefer and colleagues [1]. The two applications of dual phase parathyroid scintigraphy in patients with primary and secondary hyperparathyroidism are to localize hyperfunctioning parathyroid gland (s) before first surgery and to detect recurrent or persistent disease. Tc-99m sestamibi is the agent of choice with the recommended dose 600-900 MBq injected intravenously. Single Photon Emission Computed Tomography (SPECT) imaging performed in addition to the planar images provides a more precise localization of abnormal parathyroid glands with increased sensitivity. Bilateral neck exploration had been the main strategy of hyperparathyroidism treatment for a long time. Success with this approach depends on the experience of the surgeon. Current widely accepted surgical methods for parathyroid surgery are bilateral and unilateral neck exploration, limited dissection under local anaesthesia, video-assisted parathyroidectomy and minimally invasive surgery [2]. Recently, minimally invasive parathyroidectomy (MIP) became a more selective approach allowing to early evaluation the success of surgery. MIP has revolutionized the surgical approach to hyperparathyroidism. Most primary hyperparathyroidism patients can benefit from MIP [3-6]. By using preoperative scintigraphy for localisation of parathyroid lesions, minimal invasive surgical procedures and usage of intra-operative gamma probe and radioguided surgery shortens the duration of operation. Intraoperative gamma probe is a hand-held radiation detector device guides the surgeon to dissect the radioactive target tissue. Without the use of preoperative scintigraphy both with planar and SPECT images and intra-operative gamma probe, the patient would likely have required a second operation to remove the remaining two hyperfunctioning superior small sized parathyroid glands that could be detected in only SPECT images. Easier surgical approach, shorter operation time, verification of the correct excision of the pathological tissue by the measurement of removed specimen ex-vivo are the advanges of the gamma-probe guided surgery. Minimally invasive parathyroidectomy (MIP) has gained worldwide acceptance in the surgical treatment of sporadic primary hyperparathyroidism. However, it is used in patients with secondary hyperparathyroidism. After removal of the enlarged parathyroid gland, and while the patient is still under anesthesia, the surgeon should be perform a blood test (Quick intraoperative parathyroid hormone assay-IOPTHA) checking the patient's parathyroid hormone level in the operating room. Because parathyroid hormone is very short-lived in the bloodstream (half life about 3.5 minutes), hormone levels are observed to fall >50% or into the normal range within 10 minutes of removing the diseased parathyroid gland . This blood test will allow the surgeon to confirm that all enlarged parathyroid glands have been removed before the patient leaves the operating room. It will be helpful for both prevention of recurrences and for avoidance from second operation. Because second operation for parathyroid surgery has high complication and low success rate. As a limitation of the study, we did not use intraoperative parathyroid hormone assay (IOPTHA) during the operation in this case because of technical reasons.

There are evidences supporting a positive impact of renal residual function (RRF) on survival and quality of life of dialysis patients [7]. Prolonged exposure to anesthetic agents reduces residual renal function. For this reason, the duration of exposure to anesthetic agents is an important factor in determining mortality [8]. There was no change in RRF of our patient postoperatively. This finding supports the impact of the duration of exposure to anesthetic agents.

Conclusion

As a conclusion, we recomment preoperative localisation of parathyroid glands with sestamibi scintigraphy performed both with

planar and SPECT imaging and intraoperative gamma probe detection at surgery especially for HD patients for supporting RRF.

References

1. Taillefer R, Boucher Y, Potvin C, Lambert R (1992) Detection and localization of parathyroid adenomas in patients with hyperparathyroidism using a single radionuclide imaging procedure with technetium-99m-sestamibi (double-phase study) J Nucl Med 33: 1801-1807.
2. Gulec SA, Ugur O (2004) The intellectual and scientific basis of parathyroid surgery. Turk J Med Sci 34: 81-84.
3. Rubello D, Al-Nahhas A, Mariani G, Gross MD, Rampin L, et al. (2006) Feasibility and long-term results of focused radioguided parathyroidectomy using a "low" 37 MBq (1 mCi) 99mTc-sestamibi protocol. Int Semin Surg Oncol 3: 30.
4. Rubello D, Fig LM, Casara D, Piotto A, Boni G, et al. (2006) Italian Study Group on Radiguided Surgery and Immunoscintigraphy (GISCRIS). Radioguided surgery of parathyroid adenomas and recurrent thyroid cancer using the "low sestamibi dose" protocol. Cancer Biother Radiopharm 21: 194-205.
5. Rubello D, Casara D, Pelizzo MR (2003) Optimization of peroperative procedures. Nucl Med Commun 24: 133-140.
6. Rubello D, Casara D, Giannini S, Piotto A, De Carlo E, et al. (2003) Importance of radio-guided minimally invasive parathyroidectomy using hand-held gamma probe and low (99m)Tc-MIBI dose. Technical considerations and long-term clinical results. Q J Nucl Med 47: 129-138.
7. Ryckelynck JP, Goffin E, Verger C (2013) Commission dialyse de la Société de néphrologie. Maintaining residual renal function in patients on dialysis. Nephrol Ther.
8. Hyodo T, Koutoku N (2011) Preservation of residual renal function with HDF. Contrib Nephrol 168: 204-212.