Radio-guided parathyroidectomy for recurrent renal hyperparathyroidism caused by graft hyperplasia

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Radio-guided surgery offers several advantages in treatment of primary hyperparathyroidism. It is considered less helpful in renal hyperparathyroidism, but it could be of great advantage in the treatment of persistent or recurrent secondary hyperparathyroidism. One of the surgical options for symptomatic renal hyperparathyroidism is total parathyroidectomy with autotransplantation of hyperplastic parathyroid tissue in forearm muscles or sternocleidomastoid muscle. Recurrence can occur and is most likely caused by graft hyperplasia.

In this report we present the case of 54-year-old woman with recurrent renal hyperparathyroidism caused by hyperplasia of the graft in sternocleidomastoid muscle. Unfortunately no sutures or clips were placed at initial surgery to identify the location of the parathyroid tissue. The preoperative assessment consisting of 99mTc-sestamibi scintigraphy identified a parathyroid tissue in the middle third of sternocleidomastoid muscle. The patient underwent a radio-guided neck re-exploration that allowed a rapid localization and excision of the hyperplastic graft.

Keywords: radio-guided surgery, renal hyperparathyroidism, parathyroid hyperplasia

INTRODUCTION

Great progress in the surgical treatment of parathyroid diseases represent the use of radio-guided surgical technique which was significantly improved since the introduction in 1984. In this procedure Tc-99m-radiolabeled sestamibi is administered intravenously before the operation, and gama probe is used intraoperatively to identify the fields of increased 99mTc-sestamibi accumulation. Radio-guided technique is now successfully used for primary hyperparathyroidism allowing minimally invasive parathyroidectomy. On the other hand radio-guided surgery is currently considered not useful in secondary hyperparathyroidism during the first operation. However the intraoperative radio-guided localization could be of great advantage in the treatment of persistent or recurrent secondary hyperparathyroidism and it has been observed that in cases of redo operations the cure rate increases, the complication rate decreases and the operation takes less. We report one case of recurrent renal hyperparathyroidism treated by use of radio-guided surgery.

CASE REPORT

In 2004 a 54 year-old woman with chronic renal failure who had been receiving hemodialysis for 4 years had a secondary hyperparathyroidism developed. She underwent surgery in November 2004 in other hospital, three parathyroid glands were located and removed. Postoperatively high level of parathyroid hormone (PTH) maintains, patient had the ultrasonography done which showed enlarged parathyroid gland below the right thyroid lobe. Because of residual hyperparathyroidism patient underwent another surgery in 2005, enlarged parathyroid gland was removed with the implantation of resected parathyroid tissue in the right sterno cleidomastoid muscle. After the second operation PTH level decreases.

In January 2009 the patient presented with abdominal pain, bone pain, general weakness and skin itching and was admitted to the Emergency Center. Thorough examination revealed elevated calcium values (2.7 mmol/l ) and also elevated PTH (1334pg/ml) and creatinine (891umol/l ) values. There were no signs of acute abdominal disease that would require an emergency operation. The patient was then admitted to the Center for endocrine surgery for the parathyroid re-operation.
A 99mTc-radiolabeled sestamibi scan was obtained and increased focal uptake of radiopharmaceutical was identified in the middle third of sternocleidomastoid muscle (figure 1). After a complete preoperative assessment a radio-guided neck re-exploration was planned in the cooperation with colleagues from Center of Nuclear Medicine.

On the day of surgery patient received the Tc-99m radiolebeled sestamibi injection. After 60 minutes the first images were acquired and the patient was brought to the operating room and the surgery begun. Detection of parathyroid tissue was guided by placement of the gamma probe in the operative wound and the zone of increased concentration of radioactivity was identified in the middle third of sternocleidomastoid muscle. Hyperplastic parathyroid tissue was localized and extirpated (figure 2).

The specimen was checked for the degree of radioactivity ex vivo (2866 pulses), which confirmed that this was hyperfunctional parathyroid tissue. No other focus of increased radioactivity was detected in the operative field.

The surgery lasted 30 minutes. Postoperative course passed without complications. The patient was discharged on the first postoperative day and admitted to the Emergency Center for continuing hemodialysis. A decrease in serum calcium and PTH was observed subsequently. A five year follow-up did not show any recurrence.

DISCUSSION

Secondary hyperparathyroidism is one of the most serious complications in patients with chronic renal failure who are on long-term hemodialysis. In patients who do not respond to drug therapy surgical intervention is indicated 2-4. The two most frequently used surgical techniques are total parathyroidectomy with autotransplantation of hyperplastic parathyroid tissue in sternocleidomastoid or forearm muscles and subtotal parathyroidectomy with preservation of parathyroid tissue in situ. Total parathyroidectomy is rarely performed because it results in long-life substitution 5.

Radio-guided parathyroidectomy is now successfully used in the operative treatment of primary hyperparathyroidism 6-9. When it comes to role of radio-guided parathyroidectomy in the treatment of patients with secondary hyperparathyroidism opinions are still divided. In the secondary hyperparathyroidism all parathyroid glands are hyperplastic. Histological examination have shown a progression from a diffuse hyperplasia to a diffuse hyperplasia with early nodularity and subsequently to a nodular hyperplasia. At later stage nodular hyperplasia with its autonomous function causes partial suppression of other hyperplastic glands 7. For all the above, localization of hyperplastic parathyroid glands with 99mTc-sestamibi scintigraphy is difficult, because partially suppressed glands do not accumulate enough radiopharmaceutical to be identified 8.

However, in several prospective studies performed in recent years, the authors suggested that radio-guided parathyroidectomy is equally effective in patients with primary as well as with secondary hyperparathyroidism 11-13. Radio-guided surgical technique facilitates intraoperative localization especially of ectopic glands and allows omission of ex tempore biopsy and it is equally successful with adenomatous as well as with hyperplastic gland 11.

Radioguided technique has proved particularly successful in the treatment of residual and recurrent secondary hyperparathyroidism which occurs in 4-10% of cases after the first surgery 14. The most common cause of this condition is the existence of supernumerary or ectopic parathyroid gland which was not removed during the first surgery or its recurrence.
surgery, or autograft hyperplasia after total parathyroidectomy.

The first surgery on the neck always leads to the formation of scar tissue and distortion of normal anatomy, which makes reoperation very risky – the cure rate is lower, complications rate are higher and the surgery takes longer to perform. The use of hand held gamma probe provides guidance of dissection and the reduction of the operative field avoiding unnecessary additional neck exploration and easy identification of residual parathyroid tissue.

The most frequent localization of ectopic parathyroid glands is in fat tissue surrounding glands, in thymus and carotid sheet, why some surgeons recommend routine central dissection and cervical thymectomy at patients with secondary hyperthyroidism. Radioguided technique can help to define patients in whom it is really necessary. When it comes to ectopic parathyroid glands localized in the mediastium, gamma probe can be very useful in differentiating mediastinal parathyroid tissue from fat tissue and lymph nodes during thoracoscopic operation.

In the case of radio guided detection of transplanted parathyroid tissue in secondary recurrent hyperparathyroidism, diagnostic reliability is even greater because the tissue that surrounds transplanted parathyroid tissue consists only of the muscles that do not bind Tc-99m-sestamibi.

Our aim was to determine whether the use of hand held gamma probe could facilitate the discovery of parathyroid tissue after graft hyperplasia in circumstances when no sutures or clips were placed at initial surgery. The review of operative and pathologic reports along with preoperative assessment suggested the location of residual tissue. The hand held detection guided the dissection and allowed a rapid localization and excision of the hyperplastic graft.

The case reported suggests that radio-guided technique can be successfully used in selected cases of renal hyperparathyroidism.

**SUMMARY**

**RADIOVODENA PARATIROIDEKTOMIJA KOD REKURENTNOG SEKUNDARNOG HIPERPARATIROIDIZMA UZROKOVANOG HIPERPLAZIJOM GRAFTA**

Radiovudjena paratiroidektomija pruža znatne mogućnosti u hirurškom lečenju primarnog hipertiroidezma. Smatra se da nema velikog značaja u lečenju sekundarnog hipertiroidezma ali može pružiti znatne mogućnosti kod lečenja perzitentnog ili rekurentnog sekundarnog hipertiroidezma. Jedna od mogućnosti za lečenje sekundarnog hipertiroidezma je totalna tiroidektomija uz autotransplantaciju paratiroidnog tkiva u mišeću nadlaktice ili sternokleidomastoidni mišić. Do recidiva najčešće dolazi zbog hiperplazije grafta.

Ovde prikazujemo slučaj pedestalotvorogodišnje bolesnice sa recidivantnim sekundarnim hipertiroidezmem uzrokovanim hiperplazijom grafta u sternokleido-mastoidnom mišiću. Nažalost na prethodnim operacijama nisu plasirani klipsovi ili šavovi koji bi omogućili lako pronalaženje hiperplastičnog grafata. Preoperativnom scintigrafijom identifikovano je paratiroidno tkivo u srednjoj trećini sternokleidomastoidnog mišića. Radiovudjena eksploracija vrata omogućila je brzu lokalizaciju i eksziju hiperplastičnog paratiroidnog tkiva.

Ključne reči: radiovudena paratiroidektomija, sekundarni hipertiroidez, hiperplazija paraštitastih žlezdi

**REFERENCES**

13. Takeyama H, Shioya H, Mori Y, Ogi S, Yamamoto H, Kato N et al. Usefulness of radio-guided surgery using technetium 99-m metoxyisobutylisonitrile for pri-