

Experiences in gamma probe-guided minimally invasive parathyroidectomy

Gamma prob eşliğinde minimal invaziv paratiroidektomi deneyimlerimiz

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Abstract

Parathyroid adenoma seen in a single gland comprises 80-90% of the reasons for primary hyperparathyroidism. The recent use of parathyroid localizing techniques such as ultrasonography, Tc 99 M sesta MIBI, and gamma probe has made minimally invasive parathyroidectomy (MIP) a success in hyperparathyroidism therapy. This study evaluates the analyses and clinical characteristics of 14 patients with primary hyperparathyroidism who have undergone minimally invasive parathyroidectomy by gamma probe marking at Selçuk University, Meram Faculty of Medicine, General Surgery Clinic in the last four years. Ten of the patients were female while four were male, with a mean age of 54.6 (39-74). The patients' preoperative mean Ca levels were 11.7 mg/dl (10.1 – 13.3, normal: 8.9-10.3), phosphorous levels were 2.7 mg/dl (1.6-3.9, normal: 2.4-4.7), and PTH levels were 260.3 pg/ml (74.94 – 990.8 normal: 12-88). Among the complaints the patients had when they presented to our clinic, headache and generalized bone pain were predominant. All the patients were sedated with local anesthesia. Following a bordered flap dissection the adenoma was reached through the vertical opening of the strap muscles. The vascular structures were cut by bipolar cautery and the adenoma was removed with no damage to its capsule. The mean period of hospitalization was 1.5 days (1 to 3 days) during the postoperative period. The patients' postoperative mean Ca levels were 9.1 mg/dl while the levels of phosphorus and PTH were 3.2 mg/dl and 63.8 mg/dl respectively. Minimally invasive

Özet

Primer hiperparatiroidizmin %80-90 nedeni tek bezde görülen paratiroid adenomudur. Son yıllarda ultrasonografi, Tc 99 M sesta MIBI ve gama prob gibi paratiroidleri lokalize edici tekniklerin kullanılması ile primer hiperparatiroidi tedavisinde minimal invaziv paratiroidektomi (MIP) başarıyla uygulanmaya başlanmıştır. Bu çalışmada son 4 yılda Selçuk Üniversitesi Meram Tıp Fakültesi Genel Cerrahi Kliniği'nde primer hiperparatiroidi nedeniyle gama prob eşliğinde işaretleme ile minimal invaziv paratiroidektomi yapılan 14 hastanın analizi ve klinik özellikleri değerlendirildi. Hastalardan 10'u kadın, 4'ü erkek ve yaş ortalamaları 54,6 (39-74) idi. Operasyon öncesi ortalama Ca seviyeleri 11,7 mg/dl (10,1 – 13,3, normali: 8,9-10,3), fosfor seviyeleri 2,7 mg/dl (1,6-3,9, normali: 2,4-4,7) ve PTH 260,3 pg/ml (74,94 - 990,8 normali: 12-88) olarak ölçüldü. Hastaların kliniğimize başvuru şikâyetleri arasında baş ağrısı ve yaygın kemik ağrısı ön plandaydı. Tüm hastalara lokal anestezi ile birlikte sedasyon uygulandı. Sınırlı flep diseksiyonundan sonra strep kasları vertikal olarak açılarak adenoma ulaşıldı. Vasküler yapıları bipolar koter eşliğinde kesildi ve kapsülü zedelenmeden adenom çıkarıldı. Post operatif dönemde hastaların hastanede kalış süresi ort. 1,5 (1 ile 3 gün) gündü. Ortalama Ca seviyeleri 9,1 mg/dl, fosfor seviyeleri 3,2 mg/dl ve PTH ise 63,8 pg/ml olarak ölçüldü. Gama prob eşliğinde minimal invaziv paratiroidektomi; operasyonunun lokal anestezi ile yapılabilmesi, operasyon sonrası ağrının daha az olması

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parathyroidectomy with a gamma probe is one of the most frequently used techniques in parathyroid surgery today because the procedure can be performed with local anesthesia, there is less postoperative pain, and a lower rate of complications.

Key words: parathyroidectomy, minimally invasive surgery, gamma probe

ve düşük komplikasyon oranı ile günümüzde paratiroid cerrahisinde sık tercih edilen yöntemlerdendir.

Anahtar sözcükler: paratiroidektomi, minimal invaziv cerrahi, gama prob

Introduction

Primary hyperparathyroidism (PHPT) is a frequently seen disease of the parathyroid gland. About 80% of these cases are solitary parathyroid adenoma. While the occurrence of parathyroid hyperplasia in all parathyroid glands is around 15-20%, the ratio is 3-10% for multiple adenoma (in two or three glands). Generally the multiple-gland disease is more frequently seen in elderly patients of 60 years or older, in cases of familial hyperparathyroidism and also in MEN syndrome. Within the scope of hyperparathyroidism therapy, parathyroidectomy is the generally accepted treatment method in cases with classic "osteitis fibrosa cystica," nephrolithiasis, nephrocalcinosis, neuromuscular disease, pathological fractures, and hypercalcemic crisis¹.

The standard surgical procedure in parathyroidectomies is the analysis of the parathyroid glands through bilateral cervical exploration and the removal of the pathological glands². With developments in scanning and surgical techniques, however, the interest in minimally invasive procedures has increased. Michel Gagner performed the first minimally invasive parathyroidectomy (MIP) in 1996³. Recently, the use of parathyroid localizing techniques such as ultrasonography, Tc 99 M sesta MIBI, and gamma probe have led to the successful application of minimally invasive parathyroidectomy (MIP) in hyperparathyroidism therapy. Technically, MIP can be performed using techniques such as endoscopic parathyroidectomy, video-assisted parathyroidectomy, lateral approach parathyroidectomy, marking with ultrasound, and marking with a gamma probe (radio-guided). Most surgeons prefer MIP in the treatment of primary hyperthyroidism because it can be performed under local anesthesia and because there is less postoperative pain, lower complication rates, and better cosmetic results^{3,4}.

This study is a retrospective evaluation of the analyses and clinical characteristics of 14 patients diagnosed with primary hyperparathyroidism who have undergone minimally invasive parathyroidectomy with a gamma probe (MIRGP) at Selçuk University, Meram Faculty of Medicine, General Surgery Clinic in the last four years.

Method

There were 14 patients included in this study, 10 female and 4 were male, and their mean age was 54.6 (39-74).

Scintigraphic marking method:

The 14 patients with parathyroid adenoma previously detected by ultrasonography and MIBI scintigraphy, On the morning of the operation the lesion was marked by MIBI scintigraphy in the Department of Nuclear Medicine. The patients' heads were positioned in hyperextension by the placement of supports at the back of the shoulders and the lower part of the head. Scanning in order to locate the parathyroid adenoma was performed at hour 2 following an intravenous 740 MBq Tc 99m-MIBI injection. A Siemens e-cam gamma camera was used for the scanning.

The scans were obtained by high-resolution wide angle-collimators. The neck and the thorax were included in the scanning field within the planar take. The location of the lesion was marked by a pen on the skin of each patient diagnosed with parathyroid adenoma. The patient was transferred to the operating room immediately after scanning.

Surgical method:

After the marking procedure the patients were informed about the surgery, they signed the consent forms and were transferred to the surgical table. Each patient was supported at the back of the head and repositioned in the semi-fowler position. The patients were given local anesthesia with 20-30 cc of Prilokain 2% (Citanest fik^R) and then sedated.

Following the recommendations of Miccoli et al. great care was taken during the administration of the local anesthetic agent, sternocleidomastoid (SCM) which was injected deep into the back of the muscle. It was continued to the leading edge of the SCM muscle and all along the incision line⁵.

A 3-4 cm incision was made on the marked area. Following the bordered flap dissection the strap muscles were opened up vertically. The exact location of the adenoma was detected by following the increased activity registered by the gamma probe counter. The vascular



Figure 1. Salt-and-pepper appearance in the head graph



Figure 2. Subperiosteal reabsorption of the phalanges

structures were cut by bipolar cautery and the adenoma was removed securely without any damage to its capsule.

Results

The patients' preoperative mean Ca levels were 11.7 mg/dl (10.1 – 13.3, normal: 8.9-10.3), phosphorous levels were 2.7 mg/dl (1.6-3.9, normal: 2.4-4.7), and PTH levels were 260.3 pg/ml (74.94 – 990.8 normal: 12-88). Among the complaints the patients had when they presented to our clinic, headache and generalized bone pain were predominant. Subperiosteal bone reabsorption in patients' wrist graphs was clearly seen, while their head graphs showed a salt-and-pepper appearance. (Figures 1-2-3).

The mean period of hospitalization was 1.5 days (1 to 3 days) during the postoperative period. The patients' postoperative mean Ca levels were 9.1 mg/dl (8.8 – 9.6 normal: 8.9-10.3) while their levels of phosphorus and PTH were 3.2 mg/dl (2.2 – 4.5 normal: 2.4-4.7) and 63.8 mg/dl (36.9 – 118 normal: 12-88) respectively. Pathology results of all patients revealed parathyroid adenoma. During follow-ups a significant decrease in the presentation complaints was observed. One patient developed temporary hoarseness and another was given deeper anesthesia because the initial dose of local anesthesia was not sufficient. Only one patient developed postoperative hypocalcaemia. No complications like seroma or infection developed in the patients in the postoperative period. Of the patients diagnosed with adenoma, 13 were single adenomas, eight of which were located in the inferior right lobe and four in the inferior left lobe. After gamma probe-guided minimally invasive parathyroidectomy was performed on one patient, a detailed exploration was carried out because of persistent

hypercalcemia revealing a new adenoma. Another gamma probe-guided minimally invasive parathyroidectomy was performed on the adenoma on the opposite side. Characteristic improvements were seen in all of the patients' symptoms related to hypercalcemia in the postoperative period.

Discussion

Minimally invasive parathyroidectomy has become popular among the current surgical techniques. To perform this procedure, however, localization scanning needs to be carried out in the preoperative period. Minimally invasive procedures performed after localization analyses, especially radio-guided parathyroidectomies (MIRGP). Based on results such as low rates of recurrent nerve damage and development of hyperparathyroidism, good cosmetic results, and the shorter intraoperative



Figure 3. Parathyroid adenoma removed with gamma probe-guided technique

time and period of hospitalization, this procedure is a significant improvement on more traditional techniques. A study by Norman et al. reveals lesser recurrent nerve damage when compared to traditional methods⁶. In our study only one patient developed temporary hoarseness because of recurrent nerve damage. Although MIRGP is said to be more expensive than traditional methods, it is in fact more economic regarding both the period of hospitalization and intraoperative time⁷. The mean period of hospitalization for all patients in the present study was 1.5 days. It can be safely argued that both cost and recurrent nerve damage are less with this method when compared to traditional method.

^{99m}Tc sesta MIBI is the most frequently used and the most appropriate method for detecting parathyroid adenomas with more than 80% sensitivity among parathyroid localization methods. The accuracy of the obtained result depends on the experience of the practitioner and the institution. Ultrasonography has a sensitivity rate of more than %75 among localization methods. If both methods reveal the appearance of an adenoma in the same localization the rate of sensitivity reaches 96%¹.

The complications experienced during parathyroidectomy procedures may include the inability to locate the adenoma during the first operation because of inadequate surgical experience, the presence of parathyroid adenoma with ectopic localization, the presence of multiple parathyroid glands, and recurrence related to cell culture in the first operation. The combined use of scanning techniques is both useful in diagnosis and also increases the success of the procedure. So much so that through the sufficient use of these techniques the surgery can be completed without having to resort to additional measurement methods. Goldstein et al. performed the MIRGP technique without intraoperative PTH measurement and reported positive results (8). We also used both sesta MIBI scintigraphy and ultrasonography for the localization of the adenoma. No in-

traoperative PTH measurement was done and this enabled us to both shorten the operation time and reduce the amount of required local anesthesia. We think that intraoperative PTH measurement is not necessary if the adenoma is localized with ultrasonography and sesta MIBI. Our study reveals significant results regarding preoperative and postoperative levels of Ca, phosphorus, and PTH.

Because of its many advantages gamma probe-guided minimally invasive parathyroidectomy has become the preferred method in primary hyperthyroid therapy. It can be performed under local anesthesia and is therefore very practical; there is less postoperative pain; better cosmetic results; and there is a lower complication rate all leading to shorter periods of hospitalization and a reduction of related costs. The anxieties related to surgery with general anesthesia are also reduced leading to higher patient satisfaction.

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