Minimally invasive ultrasonography guided parathyroidectomy

Ultrasonografi kılavuzluğunda minimal invaziv paratiroidektomi

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Özet

Amaç: Primer hiperparatiroidizm olgularının %85-90'ının nedeni tek adenomdur ve bu adenomun çıkarılması ile tedavi sağlanabilir. Bu tek adenomlu hastaların teşhisinde yaygın olarak paratiroid ultrasonografi (US) ve Tc-99m sestamibi sintigrafi kullanılır. Bu çalışmanın amacı; paratiroid adenomunu belirlemede ultrason rehberliğinde minimal invaziv paratiroidektomi tekniğinin etkinliğini göstermektir.

Gereç ve yöntem: Bu retrospektif çalışmada 2006-2009 yılları arasında paratiroid adenomektomi için genel cerrahi kliniğine yönlendirilmiş 16 hastaya minimal invaziv ultrason rehberliğinde paratiroidektomi (MIUGP) uygulandı. Paratiroid US ve Tc-99m sestamibi sintigrafi ile paratiroid adenom teşhisi konan hastalar cerrahiye hazırlandı.

Bulgular: Operasyon gününün sabahında adenomun lokalizasyonu tekrar US ile doğrulandı ve cilt üzerine kalem ile işaretlendi. Lokal anestezi ile işaretli alandan yapılan küçük bir insizyonla adenom çıkarıldı.

Tartışma: Bu makalede, uyguladığımız MIUGP'nin uygulaması kolay, maliyeti düşük, hastanın işaretlemeden hemen sonra ameliyata alınabilmesi, radyasyon içermemesi ve lokal anestezi ile yapılabilmesi gibi avantajları sebebiyle deneyimli paratiroid cerrahları tarafından uygun bir teknik olarak güvenle yapılabileceğini düşünmekteyiz.

Anahtar sözcükler: işaretlenmiş paratiroid adenomu, minimal invaziv paratiroidektomi, paratiroid adenomu, ultrason, ultrason rehberliği

Abstract

Aim: In 85-90% of cases primary hyperparathyroidism is the result of a single adenoma and can be cured by the removal of this adenoma. Parathyroid ultrasonography (US) and Tc-99m sestamibi scanning are the most commonly used techniques in the identification of patients with a single adenoma. The aim of this study was to show the effectiveness of minimally invasive parathyroidectomy (MIP) technique performed under US guidance.

Material and methods: In this retrospective study the hospital records of 16 patients referred to the Department of General Surgery for parathyroid adenomectomy were reviewed. The patients, admitted between 2006–2009, were all treated with minimally invasive ultrasound guided parathyroidectomy (MIUGP). The patients diagnosed with parathyroid adenoma by parathyroid ultrasonography (US) and Tc-99m sestamibi scanning were prepared for surgery.

Results: On the morning of operation day, location of the adenoma was confirmed by a repeat ultrasonography and the skin was marked with a marker pen. The adenoma was removed from the marked region with a small incision under local anesthesia.

Conclusion: In this article we describe our technique of MIUGP with marking of the skin, an inexpensive and relatively easy technique which includes no irradiation. Because the operation is possible immediately after marking the location of the lesion and requires only local anesthesia , MIUGP can be used safely by experienced parathyroid surgeons.

Keywords: marked parathyroid adenoma, minimally invasive parathyroidectomy, parathyroid adenoma, ultrasound, ultrasound guide

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Introduction

In 85 to 90% of the cases, primary hyperparathyroidism is caused by a single parathyroid adenoma and removal of this gland is sufficient for treatment[1]. Parathyroid US and Tc-99m sestamibi scanning are valuable techniques in locating these adenomas. The specificity of parathyroid US and Tc-99m sestamibi scanning for locating parathyroid adenomas have been reported to be as 96% and approaching 100%, respectively[1,2].

The traditional surgical procedure in parathyroidectomy is bilateral exploration of all parathyroid glands and removal of pathological glands[3]. Recently, techniques such as minimally invasive radio-guided parathyroidectomy (MIRGP), minimally invasive video assisted parathyroidectomy (MIVAP) and endoscopic parathyroidectomy (EP) have been used successfully as different techniques for minimally invasive parathyroidectomy (MIP)[4].

Because MIP is possible with local anesthesia, postoperative pain is less, the complication rates are lower and better cosmetic results are possible compared to bilateral exploration of all parathyroid glands. MIP is therefore a preferred alternative to conventional surgery by the majority of surgeons in the treatment of primary hyperparathyroidism[5,6].

The aim of this study was to show the effectiveness of our MIP technique marking the parathyroid adenoma.

Materials and methods

In this study we reviewed hospital records of 16 patients referred to the Department of General Surgery for primary hyperparathyroidism and treated with minimally invasive ultrasound guided parathyroidectomy (MIUGP) during the period between 2006 - 2009.

The patients included in the study had parathytoid adenoma which were localized by both parathyroid US and Tc-99m sestamibi scanning. Patients who were diagnosed by Tc-99m sestamibi scan only were not included the study.

There were twelve female patients and four male patients in the study group The mean age of patients was 47.2 years (range 15 - 75). Arthralgia was present in eleven patients, seven patients had nephrolithiasis and two had symptoms of peptic ulcer.

In all patients, the US intervention was performed by the radiologist. The patients were positioned on the examination table, after the nape and shoulders were supported and the head was hyperextended. The parathyroid adenoma was located with a US probe and the area was marked on the skin with a marker pen. The size of the adenoma and its distance under the skin were recorded.

Informed consent was obtained from all patients. Patients were prepared on the operating table as described above and placed in the semi-fowler position. Prilocain 2% (Citanest) was applied for local anesthesia in doses varying between 20 to 30 mL. The local anesthesic agent was injected deeply behind the sternocleidomastoid muscle (SCM), continued along on the front side of the SCM and also applied along the incision site[7]. The cervical block was performed by the surgeon, the patients were also sedated by the anesthesiologist.

The previously marked skin was incised horizontally 3 cm – 4 cm. After limited flap dissection, the strap muscles were opened and retracted vertically to expose the adenoma. The vascular structures of the adenoma were separated using bipolar electrocautery. The adenomas were removed without damaging their capsules **(Fig. 1)**.

Results

Preoperative mean blood calcium level was 11,2 mg/dL (range: 9,4 – 12,4 mg/dL, reference normal values: 8,9 – 10,3 mg/dL, mean phosphorus level was 2,5 mg/dL (range: 1,7 – 3,1 mg/dL, reference normal values: 2,4 – 4,7 mg/dL) and mean parathyroid hormone level was 657,2 pg/mL (range: 83,5 – 2390 pg/mL, reference normal values: 15 – 65 pg/mL), mean vit D3 level was 18,8 ng/mL (range: 6,9 - 62,2 ng/mL, reference normal values: 10-120 ng/mL), mean ALP level was 333,7 U/L (range: 65-2578 U/L, reference normal values 40-150 U/L)

The size of the adenomas were smaller than 1 cm in seven patients, 1-2 cm in six patients and larger than 2 cm in three patients. Subperiostal bone resorption was noted in the hand x-rays of four patients, salt-pepper appearance was also noted in cranial x-rays of two patients. One patient was converted from MIP to open parathyroidectomy.

Fig. 1. The appearance of a parathyroid adenoma excised by minimally invasive ultrasonography guidance

The patients were hospitalized for a mean period of 1,3 (1–4) days after surgery. Blood calcium and phosphorus levels were measured 12 hours after the operation. Five (26,3%) patients developed postoperative hypocalcemia. Two of these patients recovered after one week of calcium replacement therapy. Three patients required calcium threapy for a longer period (an average of 4 months). None of the patients developed seroma or infection as complications of the surgery.

The operation material pathology showed parathyroid adenoma in fifteen patients and hyperplasia in one patient. However, because this patient's calcium levels normalized immediately after the operation, reoperation was not considered although he is under follow-up for developing recurrent hypercalcemia.

All of the patients presented with a single adenoma. Ten of these were located on the left inferior lobe and six on the right inferior lobe.

Postoperative mean blood calcium level was 9,1 mg/dL (range: 5,5 – 9,9 mg/dL, reference values: 8,9 – 10,3 mg/dL), mean phophorus level was 2,9 mg/dL (range: 1,7 – 3,8 mg/dL, reference values: 2,4- 4,7 mg/dL) and mean parathyroid hormone level was 124,3 pg/mL (range: 43,7 – 346 pg/dL, reference values: 15 pg/mL – 65 pg/mL).

Discussion

In recent years, MIP techniques such as endoscopic parathyroidectomy, video assisted parathyroidectomy, parathyroidectomy with lateral approach or radioguided parathyroidectomy have been used successfully by experienced surgeons[4].

Minimally invasive endoscopic parathyroidectomy (MIEP), video-assisted parathyroidectomy, and videoscopic parathyroidectomy using a lateral approach were defined by several authors[8–10]. The disadvantages of all these techniques are that they require special equipment, gas flow, endoscope and specialized staff and the operation takes a longer time to complete.

Minimally invasive radioguided parathyroidectomy was first described by Martinez et al. in 1995[11]. Reportedly, there must be a 2.5 to 3 hour delay between Tc-99m sestamibi application and the operation where the MIRGP technique is used[1,12]. This waiting period, the requirement of a gamma probe in the operating room and the additional cost caused by Tc-99m sestamibi application are the main disadvantages of MIRGP.

Parathyroid US has been reported to locate parathyroid adenomas before operation with 96% accuracy[2,13]. In this study we included patients with parathytoid adenomas diagnosed by both US and Tc-99m sestamibi scanning. It is an important advantage of MIUGP that the patient can be operated on immediately after US imaging and marking. In our opinion, the procedure is more convenient, especially in patients with thin necks. In cases where the adenoma is located in the deep cervical, retroeosophageal or retrotracheal areas, marking the lesion becomes difficult. We think that in such cases MIUGP is not suitable. Additionally, MIUGP is not suitable where MIP is not indicated such as in patients with multiglandular or recurrent disease, patients with a history of extensive neck surgery, familial primary hyperparathyroidism, parathyroid carcinoma and in patients with MEN syndrome[4].

In conclusion, MIUGP is an easy technique which has advantages such as admission of the patient to the operating room right after the marking procedure, not exposing the patient to radiation or radioactive substances and requiring only local anesthesia. It is particularly effective for patients with thin necks. Because of these advantages we recommend MIUGP with marking the lesion which can be used safely by experienced surgeons for treatment of parathyroid adenomas.

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