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The return of the bilateral neck exploration for primary Hyperparathyroidism

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ABSTRACT

Introduction:

We recommend the use of a radio guided bilateral neck exploration with the evaluation of the functionality of the four parathyroid glands to determine which should be excised for the management of primary hyperparathyroidism (PHPT). We describe the feasibility and efficacy of this technique in our patients in a hospital in Mexico.

Patients and Methods:

A cohort of 36 consecutive patients with the diagnosis of PHPT who underwent surgical intervention where obtained from a prospectively maintained database. Patients were injected with 99m-Tc sestamibi one hour prior to surgery, an exploration of the four parathyroid glands was conducted through a 2.0cm incision and ex-vivo functionality of each gland was evaluated with removal of the hyperfunctioning gland or glands. Intraoperative PTHi was measured. Patients were followed-up at 1, 3, 8 weeks, and 1 year.

Results:

One hundred percent of our patients had symptomatic PHPT. Fifty-three percent had a negative 99m-Tc sestamibi scan, and 44.4% had a single adenoma. After surgical intervention, 19.4% had a single adenoma, 36.1% a double adenoma, 33.3% a triple adenoma, and 11.1% hyperplasia. Adenomas had a 71% radioactivity over the basal count, and hyperplasic glands 20.89%. All patients had a decrease in biomarkers postoperatively. We had a failure rate of 5.5%. No patient presented significant complications.

Conclusions:

The radio guided bilateral neck exploration offers a similar cure rate to the traditional bilateral neck exploration and a greater cure rate than for unilateral parathyroidectomy, with a similar morbidity. We propose this as a safe and effective technique, and a feasible alternative in Mexico.

Keywords:

Primary hyperparathyroidism, bilateral neck exploration, radio guided parathyroidectomy

1. INTRODUCTION

Primary hyperparathyroidism (PHPT) is instigated by a hyperfunctioning parathyroid gland or glands that results in an overproduction of parathyroid hormone (PTH) with fluctuations or elevations in the serum calcium levels.[1] PHPT results in an overproduction of PTH secondary to a parathyroid adenoma in 85% to 90% of the cases, double adenomas in 6.8%to 9.2% of the

cases, multi-glandular hyperplasia in less than3%of the cases, triple adenomas in 0.2% of the cases, and carcinoma in 1%to 3.8 % of cases.[1-4]

The annual incidence of sporadic PHPT is 34 to 120 cases per 100,000 people/year, with a 3:1 female to male ratio. The average age at diagnosis is 59.9 + 13 years witha peak incidence in women older than 50 years of age (1 in 75 women).[1, 2, 5, 6] PHPT is a benign disease with a malignant potential that results in increased morbidity and mortality, reducing life expectancy by an average of five to six years.[7-9] The diagnosis of PHPT is made with a high serum calcium level (average 10.9 + 0.6 mg/dl) in the presence of a high PTH level (average 120 pg/ml), or with a significant variability in serum calcium levels(0.4 + 0.33 mg/dl).[1, 10] Approximately 2.5% of cases can present as normocalcemic hyperparathyroidism,[1, 11] and 10% to 20% with an abnormally normal or mildly elevated PTH level.[1, 12]

Many authors cite that the majority of PHPT patients are asymptomatic (80%) taking only into account the classic symptoms (*bones, stones, abdominal moans, psychic groans and fatigue overtones)* without taking into account non-specific symptoms. Clinical evidence has shown that more than 95% of patients with PHPT are symptomatic and only a few are truly asymptomatic.[13-19] The most common clinical manifestations (classically identified as asymptomatic) are neurocognitive symptoms (chronic fatigue, irritability, emotional lability, depression, general malaise, diminished libido, poor concentration, memory loss, and insomnia).[15, 17-21]

The mainstay of treatment for PHPT is the surgical removal of the hyperfunctioning gland(s) with a 90% to 100% cure rates depending on the surgical technique.[3]All patients with symptomatic PHPT and asymptomatic PHPT who meet NIH criteria are surgical candidates.[15, 17-22]

The original surgical management described by Mandl in 1925, and considered the gold standard until de 90´s, was a bilateral neck exploration in which the four parathyroid glands were localized and the macroscopically altered gland (s)were excised and with pathology confirmation.[23-25] The cure rate with this technique reached 95%.[25] This surgical technique is time consuming and has a high morbidity rate. In the 90´s with the introduction of 99m-Tc sestamibi and PTHi new focused techniques emerged with cure rates of 90% to 95%. [26-28]

The unilateral exploration became feasible with 99m-Tc sestamibi that localizes the hyperfunctioning gland.[23, 26, 29-31] However, 35% or more of the cases of PHPT have a negative sestamibi study.[32] Additionally, the development of technology to measure PTHi allowed the surgeon to measure PTH levels during surgery and thus confirm that the hyperfunctioning gland had been removed.[29-31, 33] Both of these technologies allowed a simplified directed surgical approach to excise the hyperfunctioning gland localized with the sestamibi scan without the visualization of the other parathyroid glands.[23, 26, 29-31] The measurement of PTHi levels pre-incision, pre-excision and 10 minutes post-excision accompanied this directed surgical approach.[27, 33-36] A > 50%reduction in PTHi levels at 10 minutes post-excision compared to the highest basal value, predicts normal postoperative calcium levels.[27]

In 2005, Dr. James Norman, a pioneer in directed parathyroid surgery,[26] developed a new surgical technique in which a bilateral neck exploration is performed through a 2 cm incision, a biopsy of the four parathyroid glands is obtained in-vivo and their functionality is measured ex-vivo. Only the metabolically hyperfunctioning gland(s) is/are resected.[3, 37] In a series with more than 5,000 patients (32,00 specimens), he reported a cure rate of 97%.[3, 37] Other authors have contributed to the description of this surgical technique and have reported similar cure rates.[29, 30, 38, 39] We describe the feasibility and efficacy of this technique in our patient population in a tertiary hospital in Mexico City.

2. PATIENTS AND METHODS

2.1 Study design

We conducted a retrospective, observational study from a prospectively maintained database. From this database, a cohort of 36 consecutive patients with the diagnosis of PHPT was identified. Each patient underwent surgical intervention at our tertiary hospital by a single surgeon from April 2013 to March 2015.

2.2 Patient selection [30, 37, 38]

The candidates for this procedure were patients with the diagnosis of symptomatic or asymptomatic PHPT confirmed with elevated serum calcium (>10.2 mg/dl) or patients with significant variations in there serum calcium levels who had elevated or abnormally normal parathyroid hormone (PTH) levels, who met NIH criteria for surgical management (Table 1).

Patients included in the study had the diagnosis of sporadic symptomatic or asymptomatic PHPT who met surgical criteria, were treated by a single surgeon with the described surgical technique and had at least two months(range 1 to 21 months) of clinical and biochemical follow-up. Patients with hereditary PHPT, sporadic PHPT previously treated, incomplete data, and who did not undergo at least two months follow-up were excluded.

2.3 Sestamibi[30, 37, 38, 40] and Surgical Technique[30, 37, 38, 40]

A 99-m Tc sestamibi scan (with 20 to 25 mCi of 99m-Tc sestamibi) was performed 1.5 to 2 hours prior to incision based on the previously published technique.[30, 37, 38, 40] Planar and oblique images were obtained at 15 and 60 minutes. The patient was taken immediately to the operating room after the 99-m Tc sestamibi scan.

After orotraqueal intubation and slight cervical hyperextension, a basal count is obtained with a gamma probe parallel to the carotid artery at the level of the thyroid cartilage (Fig. 1a). A pre-incision PTHi sample is obtained. A two-centimeter transverse incision is made in the midline of the neck at the level of the cricoid cartilage (Fig. 1b). After a subplatismal flap is created and the strap muscles are separated, a parathyroid gland is identified, and a biopsy is obtained. The ex-vivo counts are obtained with a gamma probe to determine its physiologic activity (Fig. 1c). The same procedure is done for the other three glands.[37, 38]The gland(s) with counts greater than 18% to 20% of the basal values are with an adenoma. A count of 10% to 16% is compatible with hyperplasia. Lymphatic's, thyroid tissue, normal parathyroid glands, and adipose tissue do not obtain counts higher than 2.2% of the basal value.[41, 42] Glands with a count compatible with an adenoma or hyperplasia are resected (Fig. 1d). A PTHi sample is obtained at 10,[27, 36] 20,[43]and 30 minutes after resection of the hyperfunctioning parathyroid glands. All excised glands are sent for definitive pathology review. This procedure can be performed in an out-patient setting,[3, 37]but because of insurance policies in our country, patients are hospitalized overnight.

2.4. Postoperative management and follow-up

The patient is placed on an oral calcium supplementation protocol from the immediate postoperative period, with the dose depending on the preoperative calcium level and number of resected glands.[44] Postoperative calcium levels are obtained on the first postoperative day.[44]

Patient follow-up consists of an outpatient office visit with history and physical exam focusing on the symptoms of the disease to document improvement at one, two, three, eight weeks, six months, and one year postoperatively. Laboratory values for serum calcium and PTH levels were obtained at eight weeks and annually after the surgery. Cure is defined as a persistent long-term reduction in serum calcium and PTH levels. Persistent hyperparathyroidism is defined as an increase in serum calcium and PTH levels less than six months after surgery.[45] If the patient presents with increase in the levels of serum calcium and PTH after six months postoperatively, the diagnosis of recurrent hyperparathyroidism is made.[45]

3. RESULTS

A total of 40 charts were reviewed. Only 36 patients were included; four patients were excluded because the surgical technique with biopsy of the four parathyroid glands was not undertaken.

Of the 36 patients, 29 patients (80.5%) were female and 7 patients (19.5%) were male. The average age at the time of surgery was 57.9 + 12.7 years old (range 29-87).The median follow-up was three months (range 1 to 21 months). Two patients were lost to follow-up before the eighth postoperative week; one because of a death not related to the disease or surgical procedure, the other one because of a diagnosis of Alzheimer´s Disease and the relatives decided not to continue with the follow-up.

Of all the patients studied (n = 36), 100% had preoperative calcium and PTH levels,

77.77% (28patients) had vitamin D levels, 77.77% (28 patients) had chloride/phosphorus ratio (Cl:P), 44.4% (16 patients) had urinary calcium levels. All patients had a 99m-Tc sestamibi scan on the day of the surgery, and all the counts and PTHi samples were available for analysis. Calcium levels on the first postoperative day were obtained in 94.4% of the cases (34 patients), at eight weeks in 80.5% of the cases (29 patients), and in 27.7% of the cases (10 patients) at one-year follow-up. Postoperative PTH values were obtained in 91.6% of the cases (33 patients) on the first postoperative day, in 80.5% of the cases (29 patients) at eight weeks, and in 25% of the cases (9 patients) at one-year follow-up.

Table 1 Patient Selection [16, 50]

Patient Selection	
Biochemical confirmation of PHPT (both criteria)	Serum calcium> 10.2 mg/dl Elevated or abnormally normal PTH (reference value10-65 pg/ml)
Symptomatic sporadic PHPT	Biochemical confirmation of PHPT with at least one symptom
NIH criteria for the surgical	1) T-score < -2.5 in any location or history of pathological fracture

management of PHPT	2) Age < 50 years-old 3) Creatinine clearance < 60 ml/min/1.73 m2 4) Serum calcium levels > 1 mg/dl above reference level (verified on 3 different occasions and having suspended drugs that interfere with calcium levels during 4 to 6 weeks) 5) Patients who cannot be adequately followed-up

Table 2 Patient's symptoms

Symptom	N = 36	Percent (%)
Asymptomatic	0	0
Neuro-cognitive symptoms	34	94.4
Depression	22	61.1
Fatigue	22	61.1
Irritability	22	61.1
Emotional lability	21	58.3
Insomnia	21	58.3
Loss of social interaction	5	13.8
Loss of memory	15	41.6
Diminished concentration	14	38.8
Anxiety	11	30.5
Headaches	9	25
Diminished libido	9	25
Osteomuscular symptoms	33	91.6
Reduction in bone density	26	72.2
Osteopenia	18	50
Osteoporosis	8	22.2
Mialgias	17	47.2
Artralgias	15	41.6
Muscular weakness	12	33.3
Bone pain	11	30.5
Diminished reflexes	1	2.7
Pathological fractures	0	0
Urological symptoms	24	66.6
Nicturia	15	41.6
Poliuria	14	38.8
Polidipsia	11	30.5
Nephrolithiasis	11	30.5
Gastrointestinal symptoms	21	58.3
GERD symptoms	16	44.4
Peptic disease	12	33.3
Constipation	7	19.4
Altered hepatic enzymes	0	0
Dermatological symptoms	13	36.1
Hair loss	9	25

Pruritus	7	19.4
Cardiovascular symptoms	5	13.8
Palpitations	5	13.8

The most common preoperative symptoms were "non-specific" neurocognitive symptoms in 94.4% of the cases. Other symptoms that the patients presented with were musculoskeletal (91.6%), urologic (66.6%), gastrointestinal (58.3%), dermatological (36.1%), and cardiovascular (13.8%). Table 2 summarizes all the symptoms reported by our patient population.

The average preoperative laboratory values were (Table 3): serum calcium 10.13 +0.6 mg/dl (range 9.16 – 11.6 mg/dl), PTH 93.82 +43.45 pg/ml (range 26.5 – 247 pg/ml), vitamin D 25.12 + 9.88 pg/ml (range 9.16 – 59 pg/ml), with all patients with vitamin D values available having vitamin D deficiency, 24 hour urinary calcium 214.5 + 91.8 mg/24 hours (range 55- 368 mg/24 hours) with all patients with this value available with less than 400 mg/24 hours, Cl:P 31.86 + 6.7 (range 22.27 – 46.95) with 39% of the patients (11 of 28 patients) with a ratio > 33:1. Figure 2 shows the values of preoperative serum calcium versus PTH.

Eleven of 36 patients presented a history of nephrolithiasis (30.55%). These patients had a preoperative serum calcium of 9.99 + 0.39 mg/dl and a 24-hour urinary calcium of 234.65 + 47.85 mg/24 hours, none had a 24-hour urinary calcium > 400 mg/24 hours. The average serum calcium levels for patients without nephrolithiasis was 10.2 + 0.64 mg/dl and the 24-hour urinary calcium was 169.62 + 123 mg/24 hours. These results are shown in table 4.

Table 3 Preoperative laboratorios

Laboratory (reference value)	Average	SD	Range
Calcium (8.5-10.5 mg/dl)	10.13	+ 0.6	9.16-11.6
PTH (14-73 pg/ml)	93.82	+ 43.45	26.5-247
Vitamin D (18-72 pg/ml)	25.12	+ 9.88	9.16-59
24 hr urinary calcium (20-275 mg/24 hrs)	214.5	+ 91.8	55-368
Cl/P ratio (<33:1)	31.86	+ 6.7	22.27-46.95

Table 4 Serum calcium and 24-hour urinary calcium levels

	Serum calcium (mg/dl)	SD	Urinary calcium (mg/24 hrs)	SD
with nephrolithiasis (n=11, 30.55%)	9.99	+ 0.39	234.65	+ 47.85
without nephrolithiasis (n=25, 69.44%)	10.2	+ 0.64	169.625	+ 123

All patients had a 99m-Tc sestamibi scan on the day of the surgical procedure. The reports of these scans were: normal scan in 19 patients (52.7%), single adenoma in 16 patients (44.4%), double adenoma in one patient (2.7%). No patients had a diagnosis of triple adenomas or hyperplasia on imaging. Only six patients (16.6%) had a positive correlation between the sestamibi scan and the described technique and pathology (table 5): single adenoma in seven patients (19.4%), double adenoma in 13 patients (36.1%), triple adenoma in 12 patients (33.3%), and hyperplasia in four patients (11.1%). The average basal radioactivity was 245.31 counts per second (range 60 – 700). The average radioactivity (Table 6) for adenomas compared with the basal radioactivity was 71%, 20% for the hyperplasic glands, and 8.7% for normal glands.

Twenty-one patients presented a significant decrease in their PTHi levels at 10 minutes post-resection and 15 patients did not show a significant decrease in there PTHi levels at 10 minutes (58.3% vs. 41.7%). At 20 minutes post-resection 27 patients presented a significant decrease and 9 patients did notin their PTHi levels (75% vs. 25%). At 30 minutes post-resection 31 patients presented a significant decrease and five patients did not in their PTHi levels (86.1% vs. 13.9%). Of the patients who did not have a significant

decrease in PTHi at the 10-minute mark following resection, 14out of the 15 patients had a normal PTH on the first post-operative day and none presented with persistent or recurrent hyperparathyroidism. All nine of the patients who did not show a significant decrease in the PTHi level at the 20 and 30 minutes post-resection mark had normal PTH on the first post-operative day, and one patient presented with persistent and one patient with recurrent hyperparathyroidism.

During follow-up, 100% of the patients presented with a decrease of serum calcium and PTH levels compared with the pre-operative values (Table 7).

Table 5 Results of radio-guided parathyroidectomy confirmed with pathology

Pathology result	N = 36 (%)
Single adenoma	7 (19.4)
Double adenoma	13 (36.1)
Triple adenoma	12 (33.3)
Hyperplasia	4 (11.1)

Table 6 Percent above the basal count for adenomas, hyperplasia, and normal parathyroid

	Total count	Percent above basal (%)
Basal	254.3143	100
Adenoma		71
Hyperplasia		20
Normal gland		8.77

Table 7 PTH and serum calcium levels

	PTH (pg/ml)	Range	Ca (mg/dl)	Range
Preoperative	93.82	26.5-247	10.14	9.1-11.6
PO 1	31.18	1-113	8.65	7.7-10.1
PO 8 weeks	54.87	0.1-212	9.40	7.5-10.3
PO 1 year	47.13	25.2-64.4	9.20	8-10.1

Table 8 Postoperative complications

	N = 36 (%)
No complications	22 (61.11)
Surgical site infection	0 (0)
Hematoma	0 (0)
Transient recurrent laringeal nerve paralysis	2 (5.55)
Permanent recurrent laringeal nerve paralysis	0 (0)
Transient hypoparathyroidism	5 (13.88)
Permanent hypoparathyroidism	0 (0)
Recurrent or persistent PHPT	2 (5.55)

The postoperative complications are summarized in table 8. Sixty-one percent did not present a complication related to the procedure. No patient presented surgical site infection, hematoma, and permanent recurrent laryngeal nerve injury or permanent hypoparathyroidism. Only two patients (5.55%) had a transient injury of the recurrent laryngeal nerve confirmed by indirect laryngoscopy. Both patients hada complete recovery at eight weeks postoperatively confirmed by indirect laryngoscopy. Five patients (13.88%) developed transient hypoparathyroidism with paresthesias that resolved with adjustments in oral calcium supplementation protocol. All five patients had a complete recovery at eight weeks follow-up. Only one patient (2.77%) presented with severe symptoms that required in-hospital treatment with IV calcium. All the patients that developed hypocalcemia had complete resolution of their symptoms and no need for continued calcium supplementation at six months follow-up. Two patients (5.5%) had a unsuccessful surgical management; one had persistent PHPT and one had recurrent PHPT. The patient with persistent PHPT had the diagnosis of hyperplasia and after a formal bilateral neck exploration; only three of the four glands were identified. The patient with recurrent PHPT had the diagnosis of hyperplasia; a total parathyroidectomy with auto transplantation was performed. Both patients are being studied to evaluate management options.

At eight weeks follow-up, 100% of the patients had complete resolution of their neurocognitive symptoms.

4. DISCUSSION

PHPT is a disease characterized by the overproduction of PTH from one or more of the parathyroid glands that results in an elevation or fluctuation of serum calcium levels.[1] It has a 3:1 female to male ratio and a peak incidence in women older than 50 years.[1, 2, 5, 6]It is clinically characterized by neurocognitive symptoms, reduced bone mineral density, kidney-urinary symptoms, gastrointestinal, dermatologic and cardiovascular manifestations that affect the patient´s quality of life.[1, 13-19] There is no known medical management for this disease; the only treatment is surgical management reaching 90% to 100% cure rates depending on the surgical technique employed. [3]

In this study, the incidence of PHPT was higher in female patients with a 4:1 ratio, and the average age at diagnosis was 57.9 + 12.7 years, similar to the reported in the literature.[1, 2, 5, 6]

PHPT is a disease with systemic implications that affects both the patient´s quality of life and life expectancy. In our studied population there were no patients with asymptomatic hyperparathyroidism (Table 3); the most frequently observed symptoms (in 94.4% of the patients) were neurocognitive symptoms, considered "nonspecific". This is consistent with what is reported in the literature in which only five percent of patients have asymptomatic hypercalcemia.[13-22, 46] The quality of life of these patients significantly improves after parathyroidectomy[16-22, 47-49] and should be considered within the symptomatic population amenable to surgical treatment.

Ninety-two percent of the patients had bone related symptoms, 72.2% presented decreased bone mineral density (50% osteopenia and 22.2% osteoporosis). This is considered one of the classic symptoms of the disease and indication of surgical management.[16, 50] Other musculoskeletal symptoms that were reported amongst our patients, also considered "nonspecific" symptoms of the disease, myalgia's in 47.2% of the cases, arthralgia´s in 41.6% of the cases, proximal muscle weakness in a 33.3% of the cases, bone pain in a 30.5% of the cases, and a decrease in osteotendinous reflexes in 2.7% of the cases. This is consistent with what is reported in the literature as another constellation of clinical manifestations associated with PHPT.[15, 16, 18, 19, 22]

Our study supports what's reported in the literature that the PHPT occurs with multiple nonspecific symptoms and that truly asymptomatic PHPT is a rare entity that is present in less than five percent of patients.[13-22, 46] One hundred percent of the patients reported improvement in their symptoms and quality of life at eight weeks follow-up. This is consistent with what is reported in the literature in terms quality of life questionnaires and studies of memory and concentration.[1, 13, 17-22, 47, 48, 51-53] One of the limits of our study is that no specific quality of life and symptom questionnaires were performed.

It should be emphasized that there is no direct correlation between the degree of hypercalcemia and PTH levels (Fig 2), nor with the severity of symptoms.[1]

Since 1925 that Felix Mandl described his first parathyroidectomy with bilateral neck exploration for the management of PHPT, surgery has been the standard of care for this disease. For a long time, the bilateral neck exploration remained the gold standard for the management of PHPT,[24, 25, 28]with cure rates of 95% to 100%,[25] until the 90's in which new technologies emerged. As described previously, the rise of new technologies like sestamibi with 99m-Tc and the measurement of intraoperative PTH, allowed the development of new surgical techniques that in spite of a slight lower cure rate (90% to 95 %) have the advantage of a lower morbidity than the traditional bilateral neck exploration.[26-28]

Sestamibi scan allows the surgeon to locate the hyperfunctioning gland(s) and thus has been used to perform a unilateral directed surgery, eliminating the need for a bilateral neck exploration.[23, 26, 29-31] This imaging modality has erroneously been used by

clinical physicians as a confirmatory method of diagnosis, which should not be done because 35% or more of the cases of PHPT have a negative study.[32]

We performed a sestamibi scan with 99m-Tc on all patients, on the day of surgery, as described methods section. Our patients had average levels of serum calcium of 10.13 + 13 mg/dl and PTH 93.82 + 43.45 pg/ml. This could in part explain the higher percentage of negative localization studies in our study; or it could be due to statistical bias from a small patient population (type 2error). In addition, there has been a reported relationship of a high number of negative sestamibi with 99m-Tc scans in patients with multi-glandular disease.[54, 55]In one study, in patients with uniglandular disease, 96% of the sestamibi studies were positive and 4% were negative, compared with patients with multi-glandular disease in which 76% had a positive study and 24% a negative one.[54] Both studies may explain the higher rate of negative sestamibi 99m-Tc studies in our population; however, it would take more patients to corroborate this finding.

Multi-glandular disease is more prevalent in patients with PHPT with a moderate elevation in the serum calcium and PTH levels.[55-57]Up to 20% to 25% of patients with multi-glandular disease will have only modest rise in their biochemical profile.[55-57] This was observed in patients submitted to the traditional bilateral neck exploration rather than selective surgery (37% vs. 12%),[55] and those in which a decrease in PTHi>50% at 10 minutes post-resection was not observed.[56, 57] Our patients presented, on average, with moderately elevated levels of serum calcium and PTH defined as a serum calcium < 11 mg/dl and a PTH < 100 pg/ml. This would put them into the category of patients more prone to multi-glandular disease. In addition, the technique used by us, allows us to assess the functionality of each of the glands and thus determine with accuracy the hyperfunctioning gland(s).[3, 29, 30, 32, 37-39] In our patient population a single adenoma was diagnosed in 19.4% of the cases, with the rest of the patients presenting multi-glandular disease (double adenoma in a 36.1%, triple adenoma in a 33.3% and hyperplasia in 11.1%). If we had used the directed surgery methods described in the 90's, we would have had a failure rate of 30.5% for having carried out only the removal of a single gland in patients with multi-glandular disease, and 52.7% would have received expectant management or a traditional bilateral neck exploration for having presented a negative 99m-Tc sestamibi study. More studies are needed in which a bilateral exploration and assessment of the functionality of the four parathyroid glands in patients with moderate hypercalcemia to corroborate this discrepancy in incidence with what is reported in the literature.

We used the measurement of PTHi levels before the incision and at 10, 20 and 30 minutes of the removal of the hyperfunctioning gland(s)[27, 33-36, 43] with the purpose of comparing both surgical techniques, and to describe the feasibility of the radio guided bilateral neck exploration in Mexico, with results similar to those reported in the literature. The parathyroid surgery guided by PTHi levels confirms the proper removal of the diseased gland with a decrease > 50% compared with the highest pre-incision or pre-resection value (Miami criteria).[35, 36] In our study, 58.3% met these criteria after 10 minutes, 75% after 20 minutes, and the 86.1% at 30 minutes post-removal. Only two patients who did not meet these criteria persisted with elevated PTH levels on the first post-operative day.

Only 5.5% of patients in our study failed surgical management, similar to the rates reported in the literature for this surgical technique (3% to 5%), [3, 29, 30, 32, 37-39] and the traditional bilateral neck explorations.[25] Our patients had postoperative complication rates similar to those reported in the literature, and no patient had a serious one. The mortality rate in our population was cero percent. We had no patients with neck hematomas or surgical site infection; the rates reported in the literature vary from 0.3 % to 1%, and up to 3% respectively.[58, 59] Three studies reported a 25% to 40% symptomatic hypocalcemia rate and a 2% to 5% rate of severe hypocalcemia requiringintravenous calcium.[59-61] Almost fourteen percent of our patients had transient hypoparathyroidism and only two patients (5.5%) required management with intravenous calcium. None of our patients had permanent hypoparathyroidism. Laryngeal nerve palsy is reported in up 14% of patients who undergo bilateral neck exploration.[59, 62, 63] We had a transient recurrent laryngeal nerve palsy rate of 5.5% of and no patients presented with permanent lesions.

6. CONCLUSION

PHPT is a benign disease with a malignant potential that results in a significant decrease in the quality of life of the patients with increased morbidity and mortality. The physician should be able to recognize this condition and aim his clinical judgment at the search for each one of the non-specific symptoms. The gold standard for the treatment of these patients is surgery. The radioguided bilateral neck exploration through a 2.0 cm incision offers a similar cure rate to the traditional bilateral neck exploration and a greater cure rate than the unilateral directed parathyroidectomy, with a similar morbidity as the latter. We propose this as a safe and effective technique, and a feasible alternative in our medical center in Mexico City.

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