Diagnosis and Surgical Treatment of Parathyroid Adenoma (24 Case Report)

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OBJECTIVE To summarize the experience in diagnosing and treating parathyroid adenoma.

METHODS Twenty -four patients were diagnosed with parathyroid adenoma and received parathyroidectomy in our hospital. Sixteen of them presented with hyperparathyroidism. The patients received ultrasounography, CT or ^{99m}Tc -MIBI to locate the tumor site. Serum concentrations of PTH and calcium were checked before the operation. All operations were performed under general anesthesia. The adenomas were resected and the four glands explored.

RESULTS All of the patients were cured and there was no mortality in our group. The symptoms of hyperparathyroidism remitted to various degrees after the operation. PTH dropped to the normal range 2 days after operation. Serum calcium concentrations declined to different levels from the first day after operation. Seven patients developed hypocalcemia post-operation but recovered by injection of calcium gluconate. Only one of the patients with parathyroid adenoma recurred 2 years after the operation and was found to have malignancy of the parathyroid adenoma.

CONCLUSION Not all the patients with parathyroid adenoma had clinical manifestations. The CT and ^{99m}Tc -MIBI were more accurate than ultrasounography in locating the adenoma. The four glands should be explored during the operation. Protecting the recurrent laryngeal nerve from being injuried and maintaning secure hemastasis were most important.

KEYWORDS: parathyroid adenoma, diagnosis, treatment.

Parathyroid adenoma is the most common reason for hyperparathyroidism. Twenty-four patients diagnosed with parathyroid adenoma received surgical treatment in our department from January, 1997 to June, 2004. We have summarized our experience in diagnosing and treating parathyroid adenoma in the following report.

MATERIALS AND METHODS

Clinical data

This group included 10 male patients and 14 female patients with an average age of 47.2 years. The average time from the onset of the disease was 1.1 years. Sixteen patients presented with

hyperparathyroidism. The manifestations included nephrolithiasis, chronic renal failure, osteoporosis, limb muscle weakness, myalgia and fatigue. These patients had relatively long medical histories. Six patients complained of finding a painless mass in the anterior cervical region, three of which were misdiagnosed as thyroid gland adenomas. Two patients were asymptomatic, however, a mass was found in the parathyroid region by ultrasonography in a routine physical examination. Twenty-two patients had a single nodule while the other two had multiple nodules. One patient had concurrent factor X deficiency.

Imaging examination

All the patients received an ultrasound examination before operation. Seventeen were diagnosed as parathyroid adenoma while seven were misdiagnosed as thyroid adenoma. Eleven patients received a CT scan and all but one had positive findings in the parathyroid region. ^{99m}Tc-MIBI was performed in 15 patients with hyperparathyroidism. Accumulation of MIBI was found in all of the hyperfunctional parathyroid glands.

Laboratory examination

In those patients with manifestations of hyperparathyroidism, PTH concentrations were significantly higher than normal, with the highest one being 2500 pg/ml. However, only 11 of them were hypercalcemic, ranging from 2.67 mmol/L to 4.01 mmol/L (normal range 2.2 mmol/L-2.6 mmol/L). Interestingly, three patients without clinical manifestations were found to have slightly elevated serum calcium concentrations. The concentrations of serum phosphate were slightly lower than normal, ranging from 0.66 mmol/L-0.91 mmol/L (normal range 0.8 mmol/L-1.6 mmol/L). Urinary calcium excretion was determined to be elevated in five patients with hyperparathyroidism.

Operation

All the patients received surgical treatment under general anesthesia. A transverse supraclavicular incision was selected and exposure of the thyroid gland was the same as for thyroidectomy. According to the imaging locations, the involved parathyroid gland was initially explored after the inferior artery was ligated and the thyroid gland was pushed medially. The tiny blood vessels were ligated carefully and the parathyroid gland was freed from the thyroid gland and resected, making sure that the recurrent laryngeal nerve was not injured. The tumor was then sent for a frozen-section pathological examination. The other parathyroid glands were then explored so as to rule out the possibility of concurrent pathological processes. Meticulous hemostasis was mandatory throughout the procedure. The incision was closed and routine drainage applied. A re-checking of the serum concentrations of calcium and PTH was performed 1 and 2 days after the operation.

RESULTS

All the patients were cured without mortality or morbidity in our group. The final diagnoses were a single parathyroid adenoma. Two patients with multiple nodules were finally diagnosed as a parathyroid adenoma combined with thyroid adenomas. The diameters of the adenomas resected ranged from 1 to 3 cm. Three patients who were diagnosed with thyroid adenoma before operation were found to have a parathyroid adenoma according to the postoperative pathological reports. One patient was diagnosed with a benign lesion of the thyroid gland based on the frozen-section pathological examination, but was finally diagnosed as a parathyroid adenoma according to the paraffin-section report. The level of PTH in patients with hyperparathyroidism declined to a normal range just 2 days after the operation. Most patients with hypercalcemia before the operation showed different levels of decline in their serum calcium concentrations the first day after operation. However, seven patients developed symptoms of hypocalcemia such as acanthesthesia, deadlimb or even tetany, but recovered after injection of calcium gluconate. The symptoms of hyperparathyroidism remitted to various degrees after the operation based

on data at a 1-year follow-up. Although the patient with factor X deficiency had received sufficient preparation and her coagulation function was restored before the operation, she developed a severe hemorrhage and received another operation for hemastasis 4 hours after the parathyroidectomy. Only one patient has been found to have recurred 2 years after the operation and upon receiving another parathyroidectomy, a malignancy of the parathyroid adenoma was affirmed by pathological examination.

DISCUSSION

Parathyroid adenoma is a relatively rare condition in China. It has been the major cause of hyperparathyroidism, which occurs when the normal feedback control by serum calcium is disturbed or there is an increased production of PTH.[1,2] In the past, most patients presented with a widely varied spectrum of symptoms. They may have a history of renal calculeous disease, either nephrocalcinosis, or renal or ureteral lithiasis, bone diseases with definite bone involvement, osteoporosis, subperiosteal resorption, osteitis fibrosa, or a combination of renal calculus and bone disease. However, an increasing percentage of patients today are asymtomatic. In our group, 16 of the 24 patients manifested with symptoms of hyperparathyroidism, six patients presented with a painless mass in the anterior cervical region without definite symptoms and which could only be differentiated from thyroid adenoma with difficulty. That indicates that parathyroid adenomas may be insidious, and the only way it can be confirmed is by determination of serum PTH and calcium concentration.

The diagnosis of hyperparathyroidisim is dependent on the documentation of an elevated serum calcium concentration, usually in conjunction with an elevated serum PTH.[3,4] Theoretically, one should be concerned with the ionized or free fraction of serum calcium rather than those portions bounded to protein or organic anions. That is the reason why not all patients with hyperparathyroidism have abnormal serum calcium concentrations. It also indicates that the ionized serum calcium is a more accurate index for interpreting clinical manifestations.

After the diagnosis of parathyroid adenoma has been made, the next important step is to locate the site of the tumor. Ultrasounography is the first-line method to be used because it is non-invasive, convenient and an inexpensive examination. But the overall accuracy in our group was not satisfactory. Seven patients were diagnosed with thyroid adenoma. Zhang et al. [5] reported that high-frequency ultrasound can detect a parathyroid gland as small as 5 mm in diameter. That may indicate that the experience of the examiner can influence the result. ^{99m}Tc-MIBI [6] can be considered to be the first choice in diagnosing hyperparathyroidism. All the patients who received this examination in our group produced valuable data. Combined with other methods such as CT scan, it is a reliable approach in locating the site of a tumor before operation.

The presence of a parathyroid adenoma, especially with hyperparathyroidism, is an indication for parathyroidectomy. The key to success of the operation lies in the accuracy of locating the tumor before operation and a thorough exploration during the operation. The thyroid lobes are exposed and dissected anteriorly, and bilateral exploration of the parathyroid glands is recommended, except when the tumor had been located accurately with a ^{99m}Tc-MIBI examination. Our experience suggests that after ligating the blood vessels and pulling the thyroid lobes medially, the parathyroid adenoma can be exposed satisfactorily. After making sure of the course of the recurrent laryngeal nerve, the adenoma is resected carefully securing hemastasis. The specimens are routinely sent for frozen-section pathological examination. It is vital to judge the nature of the lesion by inspection while the frozen slices serve as a requirement for confirmation.[7]

The recovery is usually good and the concentration of PTH drops to a normal range the second day after operation. However, seven patients had the symptoms of hypocalcemia after their operation. This may relate to the transient reduction of the blood supply to the residual parathyroid glands and can be easily corrected with injection of calcium gluconate. Routine

monitoring of the serum calcium after the operation is mandatory.

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