

Clinical Science

Can the use of intraoperative intact parathyroid hormone monitoring be abandoned in patients with hyperparathyroidism?

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KEYWORDS:

Intraoperative intact parathyroid hormone monitoring;
Primary hyperparathyroidism;
Ultrasound;
Technetium-99m sestamibi scintigraphy

Abstract

BACKGROUND: Ultrasound (US) and technetium-99m sestamibi scintigraphy (MIBI) are used to determine the localization of abnormal glands in cases of primary hyperparathyroidism (PHPT). Intraoperative intact parathyroid hormone (iPTH) monitoring is a reliable examination used to cure PHPT. The aim was to assess the necessity of intraoperative iPTH monitoring.

METHODS: Sixty patients were examined using preoperative MIBI and US. iPTH was measured at 3 time points: (1) at the start of surgery; (2) 10 minutes after gland resection; and (3) more than 60 minutes after surgery. We defined a decreased iPTH level as an iPTH measured 10 minutes after resection that was less than 50% of the preoperative level.

RESULTS: The iPTH of 55 patients with concordant lesions decreased to within the normal range more than 60 minutes after surgery.

CONCLUSIONS: It is not necessary to monitor intraoperative iPTH when single concordant lesions are preoperatively identified on both MIBI and US.

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There are several diagnostic modalities that can be used as preoperative examinations in patients with primary hyperparathyroidism (PHPT), including ultrasound (US), technetium-99m sestamibi scintigraphy (MIBI), magnetic resonance imaging, and computed tomography scanning. The use of MIBI for PHPT imaging was first reported in 1989 by Coakley et al.¹ MIBI is especially useful for determining the preoperative localization of abnormal glands.²⁻⁸

US is often used as the first examination for preoperative localization of abnormal glands because it is safe, convenient, and inexpensive. Moreover, in the hands of the operating surgeon, US is generally as accurate or more accurate than MIBI.^{9,10}

In addition to these imaging modalities, intraoperative intact parathyroid hormone (iPTH) monitoring is a reliable predictor of successful resection in PHPT patients undergoing parathyroid surgery.¹¹⁻¹⁶ It has also been reported that intraoperative iPTH monitoring can be used to check the iPTH level as soon as 5 minutes after extraction of the lesion, thereby ensuring complete resection of the abnormal gland.¹¹ Therefore, intraoperative iPTH monitoring makes minimally invasive surgery possible.^{17,18} However,

The authors declare no conflicts of interest.

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Manuscript received September 21, 2012; revised manuscript January 23, 2013

not all institutions can perform intraoperative iPTH monitoring because of limitations in the measuring instruments, and many institutions perform surgery on the basis of the preoperative localization determined on both MIBI and US without the use of intraoperative iPTH monitoring.

We conducted this study to examine the necessity of intraoperative iPTH monitoring in PHPT patients. We evaluated whether intraoperative iPTH monitoring is useful for PHPT surgery and whether all PHPT patients should be monitored for intraoperative iPTH. In addition, we also discuss the indications for intraoperative iPTH monitoring in PHPT patients.

Methods

Sixty-three consecutive patients who underwent parathyroid surgery for PHPT at the Department of Surgery, Nagasaki University Hospital, Nagasaki, Japan, between January 2003 and July 2010 were enrolled in this study. Three patients were excluded because they had not undergone both MIBI and US to determine their preoperative diagnoses. Therefore, we evaluated a total of 60 patients in this study. The median age of the patients was 59.5 years, and 46 patients were women.

All patients underwent both MIBI and US for preoperative localization of the parathyroid lesions. All resected glands were confirmed to meet the intraoperative histological diagnosis using frozen section examinations. Although there are several criteria for intraoperative iPTH monitoring, the Miami criteria are the most useful. Under these criteria, surgical success is defined by an iPTH drop of 50% or more from the highest of either the preoperative baseline level or the pre-excision level measured at 10 minutes.¹² We measured the iPTH level at 3 time points: (1) at the start of surgery; (2) 10 minutes after abnormal gland resection; and (3) over 60 minutes after surgery. According to the Miami criteria, a complete decrease is defined as an iPTH drop after abnormal gland resection of 50% or more from the highest of either the preoperative baseline level or the pre-excision level measured at 10 minutes. The patients who did not exhibit a decrease in the iPTH level of more than 50% were assigned to the incomplete decrease group.

In cases with concordant imaging lesions on preoperative examination, we performed abnormal gland exploration and completed the surgery. Even if the iPTH level did not decrease, we finished the surgery when the preoperative diagnosis was concordant lesion on MIBI and US.

In cases with 2 or more abnormal glands or discordant imaging between MIBI and US, we first monitored the intraoperative iPTH level after performing resection of 1 of the detected abnormal glands. If the iPTH level was found to have decreased, then we did not look for the other glands. However, if the iPTH level did not decrease, then we searched for the other abnormal glands. The iPTH and calcium and phosphorus levels of all patients were evaluated during long-term follow-up at an outpatient clinic. If

the iPTH levels continued to be high, we reexamined the patients with MIBI and US.

Results

Accuracy of preoperative localization

Fifty-six (93.3%) of the 60 patients preoperatively exhibited concordant lesions on MIBI and US. There were 4 patients (6.7%) with discordant lesions identified on MIBI and US. One patient had a single lesion detected on MIBI and another lesion detected on US, 1 patient had a single lesion detected on MIBI and double lesions detected on US, 1 patient exhibited negative results on MIBI and had double lesions detected on US, and 1 patient had double lesions detected on MIBI and a single lesion detected on US (Table 1).

Intraoperative intact parathyroid hormone monitoring

Complete decreases were observed in 50 (83.3%) of the 60 patients. Forty-seven (78.3%) of the 50 patients had concordant lesions detected on both MIBI and US at the time of the preoperative diagnosis. Three patients who exhibited complete decreases had discordant lesions detection on MIBI and US. However, the intraoperative iPTH levels of 2 of these 3 patients dramatically decreased after resection of 1 abnormal gland (Table 1). The remaining patient had discordant lesions detected on MIBI and US; 2 tumors were observed on the preoperative MIBI examination, and 1 tumor was observed on US. After surgery, this patient was suspected to have multiple endocrine neoplasia type I tumors. However, we could not confirm the diagnosis because the patient dropped out of the follow-up.

An incomplete decrease was observed in 10 patients (16.7%). However, in 9 of these 10 patients, the level of iPTH ultimately decreased to within the normal range over 60 minutes after abnormal gland resection. These 9 patients had concordant lesions on preoperative MIBI and US. In the remaining patient, the iPTH level was unchanged after 1 gland resection. Preoperatively, this patient exhibited negative results on MIBI and 2 lesions on US. Although the intraoperative iPTH level did not decrease after resection of 1 lesion, it did completely decrease after a second lesion

Table 1 Preoperative diagnosis by MIBI and US

Group	MIBI and US result		total
	Concordant	Discordant	
Complete decrease	47	3	50
Incomplete decrease	9	1*	10
Total	56	4	60

MIBI = technetium-99m sestamibi scintigraphy; US = ultrasound.
*Double adenomas patient.

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