Surgery for Primary Hyperparathyroidism: What is the Best Approach?

Parathyroidectomy is the only curative treatment for primary hyperparathyroidism (HPTH). The surgical approach to patients with primary HPTH has evolved since the first successful parathyroidectomy performed by Felix Mandl in 1925.1,2 During that operation, a single parathyroid adenoma was resected after a bilateral neck exploration and identification of all four parathyroid glands.3 Since then, bilateral neck exploration with resection of enlarged parathyroid glands has emerged as the standard operation performed for primary HPTH. It is associated with a more than 95% cure rate and minimal morbidity in the hands of an experienced endocrine surgeon.3,4 However, because over 80% of primary HPTH cases are due to a single parathyroid adenoma, many have questioned the need for bilateral neck explorations and have proposed directed, unilateral approaches termed “minimally invasive parathyroidectomies.”5–8 While these minimally invasive procedures may differ slightly in the technical details of the operation, they all rely on preoperative localization, usually with high-quality Tc-99m sestamibi-SPECT scanning, and share a common goal of resecting a single, enlarged parathyroid gland.

So what are the advantages to a minimally invasive approach when the standard bilateral neck exploration is usually highly successful and associated with minimal complications? In theory, a less invasive operation should offer similar cure rates but result in fewer complications, a shorter hospital stay, and a quicker recovery time. As demonstrated by Udelsman,2,9,10 Irvin,7,11 and others, minimally invasive parathyroidectomy when compared to bilateral explorations leads to lower hospital costs, shorter length of stays, and equally high cure rates with low complication rates.2,5–8 However, almost all of these nonrandomized, largely retrospective series have failed to find any difference in complication rates between bilateral and unilateral operations. Moreover, until now, there have been no randomized, prospective trials addressing the issue of bilateral versus less invasive unilateral approaches for patients with primary HPTH.

In the article by Bergenfelz et al, the authors report the first prospective randomized trial comparing bilateral versus unilateral (directed) neck exploration for primary HPTH.12 The primary end-point in the study was oral calcium consumption in the immediate postoperative period. Secondary end-points included symptomatic hypocalcemia, cure rate, complication rate, operative time, and hospital costs. In this study, 47 patients were randomized to unilateral exploration with preoperative sestamibi scanning and intraoperative parathyroid hormone measurement, but only 29 (62%) actually had unilateral exploration. The other 41 patients underwent standard bilateral exploration without localization or intraoperative parathyroid hormone testing. The authors found that patients in the unilateral exploration group had a lower incidence of severe symptomatic hypocalcemia and consumed less calcium than patients in the bilateral group. Interestingly, these differences were apparent despite the fact that only 62% of the patients in the unilateral group actually had a unilateral exploration (intention-to-treat analysis). Importantly, all operations were performed by surgeons with significant experience in parathyroid surgery. Thus, there was no difference in cure rates or complications between patients in the two groups. The authors conclude that unilateral, directed exploration with intraoperative parathyroid hormone testing for patients with primary HPTH is a valid surgical strategy with distinct advantages.

In addition, these data from Bergenfelz et al demonstrating a lower rate of transient hypocalcemia with smaller operations are consistent with a recent study published by our group looking at patients with tertiary HPTH.13 We found that patients who underwent limited resection of a single or double adenoma had equivalent long-term cure rates compared to patients undergoing more extensive resections. Importantly, the incidence of transient hypocalcemia was significantly lower in the patients who had limited resections (5% vs. 27%).

The question to be answered, then, is: “What is the best surgical approach for patients with primary HPTH?” Minimally invasive parathyroidectomy is the ideal surgical treatment for patients with primary HPTH and single-gland disease. In addition to the lower incidence of transient hypocalcemia, as shown by Bergenfelz et al.12 minimally invasive parathyroidectomy, as demonstrated by many, including Udelsman2,5,10 and Irvin7,11 is associated with lower costs, shorter hospital stays, and quicker recovery time. Furthermore, as previously shown by Udelsman2 and LoGerfo14 these less invasive procedures can be performed under regional anesthesia in the form
of a superficial cervical block. This allows assessment of recurrent laryngeal nerve function by monitoring the patient’s voice during surgery.

At our institution, once the diagnosis of primary HPTH has been biochemically confirmed, we preoperatively localize all patients starting with a Tc-99m sestamibi-SPECT scan. If the sestamibi scan suggests a single parathyroid lesion, we proceed with a minimally invasive approach under regional anesthesia utilizing several adjuncts, including a gamma probe to facilitate intraoperative adenoma localization and intraoperative parathyroid hormone measurements to confirm cure and rule out a second adenoma or multigland disease. If the sestamibi scan is negative, we generally perform a second localization study with thallium-pertechnetate subtraction scanning, which in our experience detects a single adenoma in an additional 10% to 15% of patients with a negative sestamibi scan (Sippel et al., manuscript submitted). If both scans are negative, we then perform a standard bilateral neck exploration.

A word of caution about minimally invasive parathyroidectomy: this procedure may not be available at all institutions due to the lack of one or more of the critical components for the operation. The most important component is a surgeon with experience in parathyroid surgery. In my opinion, surgeons should not be performing less invasive approaches unless they know how to do standard bilateral explorations well. Second, high-quality localization is necessary to select patients with single-gland disease. In our experience, a combination of Tc-99m sestamibi-SPECT and/or thallium-pertechnetate subtraction scanning with intraoperative gamma probe allows localization of about 75% of patients with primary HPTH who are candidates for the minimally invasive procedure. Third, the intraoperative parathyroid hormone assay is crucial to rule out multigland disease intraoperatively. Approximately 10% to 15% of patients with sestamibi scans suggesting a single enlarged gland will have multigland disease. Excising a single gland without intraoperative parathyroid hormone testing results in cure rates less than 90%, which is inferior to the more than 95% success rate reported with standard bilateral neck exploration. Finally, we must keep in mind our mission to train future surgeons. As more minimally invasive parathyroidectomies are performed, residents will get less exposure to bilateral explorations.

In summary, as shown in the study by Bergenfelz et al., unilateral, directed approaches such as minimally invasive parathyroidectomy can achieve equal cure rates with potentially fewer complications when compared to the standard bilateral neck explorations. Therefore, minimally invasive parathyroidectomy is rapidly becoming the procedure of choice for patients with primary HPTH and a single parathyroid adenoma. However, the success of these less invasive approaches is highly dependent on surgeon experience, good-quality preoperative localization, and intraoperative parathyroid hormone testing.

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References