

# Inadvertent parathyroidectomy during total thyroidectomy and central neck dissection for papillary thyroid carcinoma

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**Background.** The main drawback of central neck lymph node dissection is postoperative parathyroid failure. Little information is available concerning inadvertent resection of the parathyroid glands in this setting and its relationship to postoperative hypoparathyroidism. Our aim was to determine the prevalence of inadvertent parathyroidectomy during total thyroidectomy and central neck dissection for papillary thyroid cancer and its impact on short- and long-term parathyroid function.

**Methods.** This was a prospective observational study of consecutive patients undergoing first-time total thyroidectomy with a central neck dissection for papillary carcinoma >10 mm. Prevalence and risk factors for inadvertent parathyroidectomy were recorded. Serum calcium and intact parathyroid hormone concentrations were determined 24 hours after operation and then periodically in patients developing postoperative hypocalcemia. All patients were followed for a minimum of one year.

**Results.** Whole gland (n = 33) or microscopic parathyroid fragments (n = 14) were identified in 47/170 (28%) operative specimens. The lower parathyroid glands were involved more often. Variables influencing inadvertent parathyroidectomy were extrathyroidal extension of the tumor and therapeutic lymphadenectomy. Neither lateral neck dissection nor the number of lymph nodes retrieved affected the rate of inadvertent parathyroid resection. Postoperative hypocalcemia and permanent hypoparathyroidism were more frequent after inadvertent parathyroidectomy (64% vs 46% and 15% vs 4%; P ≤ .03 each).

**Conclusion.** Inadvertent parathyroidectomy during total thyroidectomy with central neck dissection for papillary thyroid carcinoma is common and involves the inferior glands more frequently in patients with extended resections and clinical N1a disease. Inadvertent resection of parathyroid glands is associated with greater rates of postoperative hypocalcemia and permanent hypoparathyroidism. (Surgery 2016;■:■-■.)

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SINCE THE PIONEERING STUDIES OF Scandinavian and Japanese surgeons,<sup>1-3</sup> central neck lymph node dissection (CND) has been adopted in many specialized endocrine surgery units in addition to total thyroidectomy for the operative treatment of papillary thyroid cancer. It is a sound oncologic procedure based on the well-known pattern of lymph node dissemination of this type of thyroid malignancy.<sup>3</sup>

The main drawback of CND whether performed with a therapeutic or prophylactic intention is

postoperative hypoparathyroidism secondary to thermal or traumatic injury to the parathyroid gland, autotransplantation, devascularization, or inadvertent resection.<sup>4-7</sup> A recent systematic review reported that in papillary thyroid cancer, prophylactic CND decreases locoregional recurrence, but this study also identified hypocalcemia as the main cause of morbidity. When temporary hypocalcemia was excluded, morbidity of total thyroidectomy with CND was similar to that of total thyroidectomy alone.<sup>8</sup>

Unintentional parathyroidectomy during total thyroidectomy has been recognized only recently as a major cause of postoperative hypoparathyroidism,<sup>6</sup> because the number of parathyroid glands remaining in situ is a powerful, independent, predictive variable of rates of permanent hypoparathyroidism.<sup>9,10</sup> No detailed information is available currently, however, on the prevalence of

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inadvertent parathyroidectomy during total thyroidectomy with CND for papillary thyroid cancer nor has its impact on postoperative parathyroid function been investigated properly.

The purpose of the present study was to assess the rate of inadvertent parathyroidectomy during total thyroidectomy with CND for papillary thyroid cancer (>10 mm) and its influence on the development of postoperative hypocalcemia and permanent hypoparathyroidism.

## METHODS

A prospective, longitudinal, observational cohort study was performed on consecutive adult patients undergoing first-time total thyroidectomy with CND (plus lateral modified radical neck dissection when indicated) for papillary thyroid carcinoma >10 mm. Patients were diagnosed by fine needle aspiration cytology and underwent operation at the Hospital del Mar in Barcelona, Spain, a referral Endocrine Surgery Unit, by the same, experienced operative team of 2 surgeons (ASS and JS). Exclusion criteria were reoperations for recurrence, completion thyroidectomies, incidentally found carcinomas, and patients with an associated parathyroid adenoma.

**Operative technique.** CND was performed as an ipsilateral or bilateral, paratracheal node clearance according to the anatomic landmarks defined by Uchino et al.<sup>11</sup> On the right, dissection was carried out anteriorly and posteriorly to the recurrent laryngeal nerve, whereas on the left, node dissection was performed anteriorly. Prophylactic CND was performed ipsilateral to the tumor in patients with a clinical N0 compartment VI (either in preoperative imaging or intraoperative findings). No frozen section biopsies of normal or suspicious lymph nodes were performed.

Therapeutic CND was performed bilaterally on the basis of preoperative or intraoperative identification of nodal metastasis. Intraoperative parathyroid location was recorded in the operative report for all 4 positions. Thymectomy was avoided in prophylactic CND and, whenever possible, also in therapeutic dissections unless the thyro-thymic ligament was involved by metastatic lymph nodes. Parathyroid autotransplantation was performed if glands appear to be devascularized completely or found when parathyroid glands were in the operative specimen before sending it for pathologic analysis.

**Parathyroid gland identification.** All operative specimens were processed by the same dedicated pathologist (AM). Pathology reports were filled in according to an established protocol, including

the possible identification of parathyroid tissue in the specimen and its location. Size of the tumor, multicentricity, extracapsular extension, and the number of positive resected lymph nodes in the central compartment were recorded. Whether the parathyroid glands were intrathyroidal or not, however, was not part of the recorded protocol.

Inadvertent parathyroidectomy was defined as the presence of a whole parathyroid gland(s) or parathyroid tissue fragments ( $\leq 1$  mm) in the perithyroidal area and/or the central lymphadenectomy specimen. The most probable position of the inadvertently resected gland(s) was defined according to data recorded in the operative and pathology reports. The number of parathyroid glands remaining in situ (PGRIS) was calculated according to the formula:  $4 - (\text{glands autotransplanted} + \text{inadvertently resected})$ .

For statistical analysis, the number of PGRIS was classified in the 3 categories, PGRIS 1–2, PGRIS 3, and PGRIS 4 according to the number of glands remaining in situ.<sup>9</sup> Patients with 1 or 2 parathyroid glands remaining in situ were pooled together, because there were few in number.

**Patient management.** Serum calcium and intact parathyroid hormone (iPTH) levels were determined 24 hours after thyroidectomy and then serially during follow-up in those patients developing postoperative hypocalcemia defined as serum calcium <8 mg/dL (2 mmol/L) 24 hours after operation. Permanent hypoparathyroidism was defined as a subnormal serum iPTH concentration (<13 pg/mL) and/or the persistent need for calcium and vitamin D replacement therapy at the last follow-up visit and always after at least one year postoperatively.<sup>12</sup> All patients were followed in our unit indefinitely as part of our protocol for managing papillary thyroid cancer. When necessary, follow-up information was also gathered from the referring physicians.

**Statistical analysis.** An anonymized database was created and exported to SPSS software (version 22.0; IBM, Armonk, NY). The prevalence of inadvertent parathyroidectomy was calculated for the whole series and for the 2 types of CND (therapeutic or prophylactic) in relation to the number of retrieved nodes and lateral neck dissection (Fisher exact test). Parathyroid function was investigated comparing serum calcium and iPTH levels at 24 hours in patients with or without inadvertent parathyroidectomy (Student *t* test) and the proportion of patients developing permanent hypoparathyroidism (Fisher exact test). Other numerical variables normally distributed were compared using the unpaired, 2-tailed

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