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Complications of Neck Dissection for Thyroid Cancer

W. Keat Cheah, M.D.,[1] Cumhur Arici, M.D.,[1] Philip H.G. Ituarte, M.P.H., Ph.D.,[1] Allan E. Siperstein, M.D.,[2] Quan-Yang Duh, M.D.,[3] Orlo H. Clark, M.D.[1]

[1]Department of Surgery, University of California, San Francisco/Mt. Zion Medical Center, 1600 Divisadero Street, San Francisco, California 94143-1674, USA
[2]Department of General Surgery, Cleveland Clinic Foundation, 9500 Euclid Avenue, Desk A80, Cleveland, Ohio 44195, USA
[3]Department of Surgery, University of California, San Francisco/Veterans Administration Medical Center, 4150 Clement Street, 112C, San Francisco, California 94121, USA

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Abstract. Prophylactic and therapeutic neck dissections are used to control or eliminate local nodal disease in patients with thyroid cancer. The purpose of this study was to evaluate the results and complications of neck dissection. From 1992 to 1999 a series of 115 consecutive neck dissections were performed in 74 patients (32 men, 42 women; mean age 48 years) with thyroid cancer and nodal metastases. Operations included central compartment, lateral modified, and suprahyoid dissection with and without total or completion thyroidectomy. Sixty-four percent of the patients had papillary, 4% follicular, and 32% medullary thyroid cancer. Complications included transient hypocalcemia (23%) defined by a postoperative serum calcium level of < 2.0 mmol/L (8.0 mg/dl), one neck hematoma (0.9%), and one cardiac death (0.9%). There were no permanent recurrent nerve palsies. Hypocalcemia occurred more frequently when neck dissection was combined with total thyroidectomy than without it ($p < 0.005$). In this group, the incidence of hypocalcemia was higher after central, than lateral, neck dissection. When neck dissection was performed without thyroidectomy, there was no difference in the rates of hypocalcemia between central, lateral, or central with lateral neck dissection (p = NS). Hypocalcemia did not increase with repeated neck dissections (p = NS). Permanent hypoparathyroidism occurred in 0.9%. There were no complications after suprahyoid dissection. The median duration of hospitalization was 1 day. Therapeutic neck dissection or repeated neck dissection can be performed relatively safely in patients with thyroid cancer. Hypocalcemia occurs most frequently when neck dissection is combined with total thyroidectomy.

Lymph node metastasis is common in patients with papillary (25–60%) or medullary (10–60%) thyroid cancer but is relatively uncommon in those with follicular cancer (0–5%) [1]. The incidence of palpable metastases is lower than the true incidence of micrometastases determined from prophylactic lymphadenectomy. Nodal metastasis is a source of recurrent disease. The presence of involved cervical lymph nodes is of more concern in patients with medullary thyroid cancer than in patients with papillary thyroid cancer. Prophylactic and therapeutic node dissections are advocated for patients with medullary thyroid cancer, whereas only therapeutic node dissection is usually advocated for patients with papillary thyroid cancer. There is controversy about the prognostic consequences in patients with papillary thyroid cancer and nodal metastases. Some surgeons believe the long-term survival for patients who have papillary thyroid cancer is not greatly influenced by the presence of lymph node metastases, whereas others believe the prognosis is worsened by the presence of nodal disease, at least in a select group of patients [2–5]. Nodal metastasis with medullary or follicular cancers is generally associated with lower survival rates [6]. Virtually all surgeons recommend a functional neck dissection to control regional disease when clinically palpable nodes are present.

Lymphadenectomy can be accomplished by: (1) central clearance of paratracheal lymph nodes (CND) between the carotid arteries down to the innominate vessel (level VI), (2) lateral modified radical neck dissection (MRND) extending from the carotid artery to the trapezius muscle and from the subclavian vein to the hypoglossal nerve (levels II–V); and (3) suprahyoid dissection (SHND). "Node picking" or removal of solitary enlarged nodes is usually not recommended because of the higher incidence of local recurrence compared to that seen with MRND [7].

Potential complications from central neck dissection include hypoparathyroidism, recurrent laryngeal nerve palsy, external laryngeal nerve injury, or injury to the trachea or esophagus. Potential complications from lateral neck dissection include injury to the thoracic duct, to the internal jugular vein or carotid artery, and to the spinal accessory nerve, superficial cervical nerves, hypoglossal nerve, brachial plexus, phrenic nerve, and sympathetic cervical plexus. Other complications are seroma, wound infection, and hemorrhage.

The aim of this study was to determine the morbidity from a consecutive series of patients having therapeutic neck dissections for thyroid cancer with nodal metastases.

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W. Keat Cheah, M.D., is now at National University Hospital, Singapore 119074.

C. Arici, M.D., is now at Department of Surgery, University of Antalya, Turkey/Akdeniz Universitesi Dumlupinar Bulvari, 07058 Kampus, Antalya, Turkey.

Correspondence to: O.H. Clark, M.D.

Table 1. Patient characteristics and histopathology.

Parameter	Papillary cancer (n = 47)	Medullary cancer (n = 24)	Follicular cancer (n = 3)
Male:female	19:28	13:11	2:1
Age (years)			
Mean	48	49	72
Range	17–83	17–86	65–78
Tumor size (cm), mean	2.4	3.0	4.0
% Positive yield of nodes	88	77	50

Methods

The records of 74 consecutive patients who had neck dissections for thyroid cancer between 1992 and 1999 at the University of California—San Francisco (UCSF) Hospitals were reviewed from our prospectively obtained database. Therapeutic neck dissection was performed for clinically evident lymphadenopathy or in patients in whom imaging studies suggested nodal metastasis who usually had elevated blood thyroglobulin levels. Prophylactic neck dissection was done only in patients with medullary thyroid cancer. Information was analyzed for clinical presentation, histopathologic characteristics, types of neck dissection, outcome, and complications. Transient hypocalcemia was defined as a serum calcium level below 2.0 mmol/L (8.0 mg/dl) (normal 8.5–10.2 mg/dl) on the first postoperative day. Permanent hypoparathyroidism was defined as persistent hypocalcemia 6 months after surgery that required treatment with calcium and vitamin D. Nerve palsy was assessed clinically and was determined by the deficit in function (e.g., hoarseness from recurrent laryngeal nerve or shoulder drop from spinal accessory nerve palsies). In general, only patients who had hoarseness underwent direct laryngoscopy.

Results

There were 32 men and 42 women with a mean age of 48 years (range 17–86 years). A total of 115 neck dissections were performed.

Clinical Presentation

Among the patients, 34 underwent all of their operations at UCSF hospitals; 40 underwent thyroidectomy and node biopsy with or without neck dissections in other hospitals and were referred to UCSF for completion thyroidectomy and repeat or contralateral neck dissections. The proportion of patients who had a second neck dissection was 47%, a third neck dissection 18%, and a fourth neck dissection 5%. The median duration between the first and second neck dissections was 12 months (range 1–54 months) and between the second and third dissections 12 months (range 1–34 months). The mean number of neck dissection per patient was 1.7 for patients with papillary or medullary cancer.

Histopathology

Sixty-four percent of the patients had papillary, 32% medullary, and 4% follicular thyroid cancer. Patient characteristics, tumor size, and lymph node involvement are shown in Table 1.

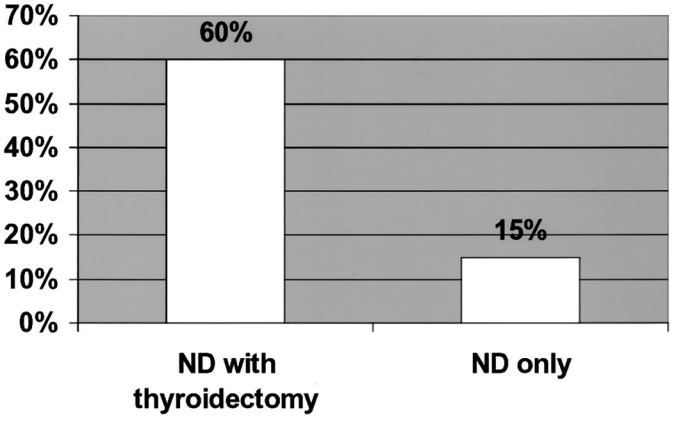

Fig. 1. Incidence of postoperative hypocalcemia when neck dissection (ND) was combined with thyroidectomy (or not).

Complications

Complications were postoperative hypocalcemia in 27 patients (23%) and one neck hematoma (0.9%) that required surgical drainage. There was one death in an 83-year-old patient with a history of heart disease who developed cardiac and multisystem failure postoperatively and died 4 days after surgery. There were no nerve palsies (recurrent laryngeal, phrenic, hypoglossal, spinal accessory, sympathetic, or brachial plexus), no thoracic duct injury, and no tracheal or esophageal complications.

Hypocalcemia was more common when neck dissection was combined with thyroidectomy than when it was not (60% vs. 17%; $p < 0.005$) (Fig. 1). In the group of patients who underwent neck dissection and concurrent thyroidectomy, the incidence of hypocalcemia was highest in patients with central neck dissection (75%), less with central neck and modified radical neck dissection (67%), and even less with modified radical neck dissection alone (46%). There were no complications in patients who had suprahyoid dissections.

When neck dissection was performed without thyroidectomy, there was no difference in the hypocalcemia rates for CND, MRND, or CND plus MRND (10% vs. 16% vs. 11%; p = NS) (Fig. 2). Furthermore, hypocalcemia did not increase with repeated neck dissections (p = NS). There was also no difference in the transient hypocalcemia rate for the papillary (26%) and medullary (25%) cancer groups.

The overall incidence of transient hypocalcemia, as defined by a serum calcium level < 2.0 mmol/L (8.0 mg/dl), was 23%. If we had selected a calcium level of 1.9 mmol/L (7.6 mg/dl) to define postoperative hypocalcemia (rather than 8.0 mg/dl), our transient hypocalcium rate would have been 11%. Of those who had transient hypocalcemia, data on serum calcium levels (6 months or more after operation) were available for 77% of patients. One patient has had permanent hypoparathyroidism since surgery and requires calcium tablets and vitamin D because of persistent hypocalcemia. He had been referred from another medical center with a recurrent laryngeal nerve injury and hypocalcemia before his two neck dissections at UCSF. The incidence of permanent hypoparathyroidism was 0.9% (1/115 operations). The median

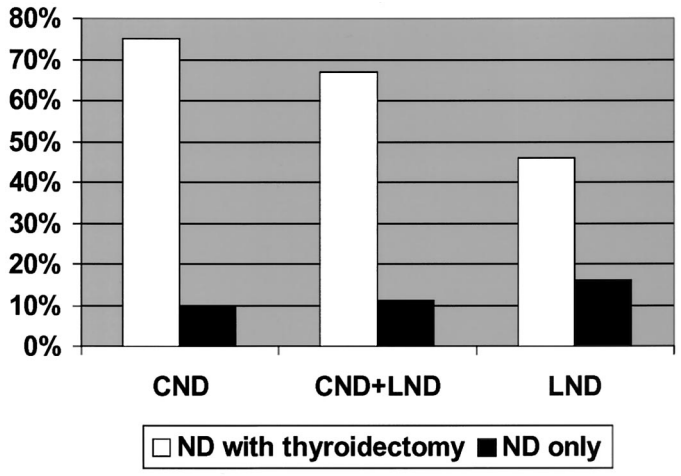

Fig. 2. Incidence of postoperative hypocalcemia after neck dissection, with or without thyroidectomy. CND: central neck dissection; LND: lateral neck dissection; CND+LND: CND combined with LND.

period of hospitalization was 1 day [100 patients, with 6 patients hospitalized more than 2 days (range 1–42 days)].

Discussion

This study showed that the most significant morbidity following prophylactic and therapeutic neck dissection for thyroid cancer was transient hypoparathyroidism. This complication occurred most often when neck dissection was combined with total thyroidectomy. Hypocalcemia was uncommon after only central neck dissection or modified neck dissection and did not increase with repeated neck dissection. Hypocalcemia was not related to the pathology or the extent of lymphadenopathy.

Hypoparathyroidism results when parathyroid glands are damaged during thyroidectomy due to accidental removal, damage from coagulation heat, or devascularization. The superior and inferior parathyroid glands usually obtain their blood supply from the inferior thyroid artery. An alternative blood supply to the superior glands comes from the superior thyroid artery in about 15% of cases [8]. The parathyroid vessels are tiny, delicate, and terminal; and they can be easily injured, disrupting blood supply to the gland. This is particularly important if disruption occurs distal to the branches or the collateral blood supply. For hypoparathyroidism to occur, usually three or more parathyroid glands are damaged.

The inferior parathyroids are commonly situated near the thyrothymic ligament and can be damaged during central nodal clearance. When there is extensive nodal involvement around the lower parathyroid glands, these glands may be purposefully removed. The superior parathyroid glands, being in close proximity to the cricothyroid area, are at lower risk during thyroid dissection because they are more dorsally situated on the thyroid and usually require less manipulation. This may account for the lower rate of transient hypocalcemia (10%) when only central clearance was performed. Thus the combination of total thyroidectomy and central neck dissection highly predisposes to hypoparathyroidism, as found in this and other studies [9].

The lateral modified radical neck dissection, preserving the motor and sensory nerves and the internal jugular vein, occurs in an area away from the parathyroid glands and recurrent laryngeal nerve. Instead, the structures mentioned before are at risk of injury. A possible explanation of why transient hypoparathyroidism occurs when only MRND is performed is that dissection near the carotid artery may have disturbed the inferior thyroid artery at its origin, thereby interrupting its blood supply to the parathyroid glands. Hypocalcemia occurred in one of five patients undergoing bilateral MRND without concurrent thyroidectomy.

Certain precautions are undertaken during thyroidectomy and neck dissection to avoid complications, particularly damage to the parathyroid glands. Magnifying glasses (operating telescopes $\times 2.5$ to $\times 3.5$) are helpful for identifying the parathyroid glands and their relation to enlarged nodes. The glands should be gently mobilized and dissected from the thyroid gland on a good vascular pedicle. Cautery should be avoided near the parathyroid glands or the recurrent laryngeal nerve. The inferior or superior thyroid vessels should be ligated near the thyroid capsule, distal to the branches that bifurcate to supply the parathyroid glands. Finally, any devascularized gland should be immediately autotransplanted into the sternocleidomastoid muscle after taking a biopsy specimen for frozen section confirmation. Some have suggested routinely autotransplanting a parathyroid gland after total thyroidectomy [10, 11] but we do this only when we are concerned about the viability of a parathyroid gland.

Conclusions

Prophylactic, therapeutic, and repeat neck dissection can be performed relatively safely for differentiated and medullary thyroid cancer. The frequency of postoperative transient hypocalcemia after combined neck dissection and thyroidectomy is higher than when these operations are not combined.

Résumé. Le curage ganglionnaire cervical prophylactique et thérapeutique permet de contrôler ou éliminer toute maladie ganglionnaire locale chez les patients atteints de cancer de la thyroïde. Le but de cette étude a été d'évaluer les résultats et les complications du curage ganglionnaire cervical. Entre 1992 et 1999, on a anlaysé les résultats de 115 lymphadénectomies cervicales réalisées chez 74 patients (32 hommes, 42 femmes; âge moyen 48 ans), porteurs de cancer de la thyroïde avec métastases ganglionnaires. L'ablation intéressait le secteur médian, le secteur latéral, et le secteur sus-hyoïdien avec ou sans une totalisation de la thyroïdectomie. Soixante-quatre pourcent des patients avaient un cancer papillaire, 4%, un cancer folliculaire et 32%, un cancer médullaire de la thyroïde. Parmi les complications on a noté une hypocalcémie transitoire (23%), définie par une calcémie postopératoire < 2.0 mmol/l (8.0 mg/dl), un cas d'hématome cervical (0.9%), et un accident cardiaque mortel (0.9%). Il n'y a eu aucune paralysie récurrentielle permanente. L'hypocalcémie a été observée plus fréquemment lorsque la lymphadénectomie a été réalisée en même temps que la thyroïdectomie totale que quand la thyroïdectomie a été isolée ($p < 0.005$). Dans ce groupe, l'incidence d'hypocalcémie a été plus élevée quand la lymphadénectomie a intéressé le secteur central que latéral. Quand la lymphadénectomie cervicale a été réalisée sans thyroïdectomie, il n'y a eu aucune différence dans le taux d'hypocalcémie entre la lymphadenénectomie centrale, latérale, ou centrale et latérale combinée (p = NS). L'incidence d'hypocalcémie n'a a pas permanente a été notée dans 0.95 des cas. Aucune complication n'a été notée après une dissection sus-hyoïdienne. La durée médiane de l'hospitalisation a été d'un jour. La lymphadénectomie cervicale, à visée thérapeutique, ou itérative, peut être réalisée avec sécurité chez les patients atteints de cancer de la thyroïde. L'hypocalcémie se produit le plus souvent lorsque la lymphadénectomie est associée à une thyroïdectomie totale.

Resumen. El vaciamiento ganglionar del cuello está indicado para controlar o eliminar la enfermedad ganglionar local en pacientes con cáncer de tiroides. El objectivo del trabajo fue evaluar los resultados y las complicaciones del vaciamiento de cuello. Entre 1992 y 1999, se realizaron 115 vaciamientos ganglionares de cuello en 74 pacientes (32 hombres, 42 mujeres; edad media 48 años) con cáncer de tiroides; se analizaraon los ganglios metastásicos. Las intervenciones afectaron al compartimento central, al vaciamiento ganglionar lateral modificado y al espacio suprahiodes, con o sin tiroidectomia total asociada. El 64% de los pacientes padecían de un cáncer papilar, el 4% folicular y el 32% de cáncer medular. Las complicaciones registradas fueron: 23% casos de hipocalcemia transitoria (definida por una calcemia postoperatoria < 2.0 mmol/l (8.0 mg/dl), 1 caso de hematoma de cuello (0.9%) y una muerte por fallo cardiaco (0.9%). No se produjo minguna parállisis recurrencial. La hipocalcemia es más frecuente cuando al vaciamiento ganglionar de cuelos se asocia una tiroidectomía total ($p < 0.005$); en este grupo, la hipocalcemia fue más frecuente tras vaciamientos centrales que laterales. Si no se realiza una tiroidectomía associada la incidencia de la hipocalcemia es similar tras el vaciamiento del compartimento central que tras el lateral, o el centro-lateral (p = N.S.). Vaciamientos ganglionares repetidos no incrementan la hipocalcemia (p = N.S.). Hipopoartiroidismo permanente se registró en el 0.9% delos casos. No se observó complicación alguna tras los vaciamientos suprahioiideos. La estancia media hospitalaria fue de 1 día. El vaciamiento terpéutico, incluso repetido del cuello, puede efectuarse con relativas garantías en pacientes con cáncer de tiroides. La incidencia de la hipocalcemia es mayor sí este vaciamiento se asocia a una tiroidectomía total.

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