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The importance of pyramidal lobe in thyroid surgery

G. GERACI, F. PISELLO, F. LI VOLSI, G. MODICA, C. SCIUMÈ

SUMMARY: **The importance of pyramidal lobe in thyroid surgery.**

G. GERACI, F. PISELLO, F. LI VOLSI, G. MODICA, C. SCIUMÈ

Introduction. *Pyramidal lobe (PL) is an embryological remnant of the thyro-glossal duct; its incidence varies from 15% to 75% but data concerning its size are lacking and limited to autoptic and radiologic evidences. Aim of our study is to elucidate the intraoperative frequency, location and surgical management of the PL.*

Patients and methods. *604 total thyroidectomy were performed between 1999 and 2007 in Unit of General and Thoracic Surgery of the University Policlinico of Palermo. The intraoperative incidence of PL was 12% (57% male, 43% female, mean age 42.5 years), but only about 50% were identified preoperatively with ultrasonography (US) (4% false positive) or with Tc-99m pertechnetate scintigraphy (8% false positive).*

Results. *In 77% of cases the lobe was affected by nodular pathology in multinodular goiter, in 1.3% by papillary cancer; in the rest of cases was normal. PL branched off more frequently from the left part of the isthmus (96%) than from the right part (4%) and in 25% of cases was associated with delphian lymph node. No PL exceeded 2 cm in length in pathologic specimen. There was no difference in thyroidectomy operative time with or without PL. At US, scintigraphic and laboratory follow-up (2 months-8 years), no incomplete resection of the gland due to the presence of PL were recorded.*

Discussion. *In anatomical studies the frequency of the PL is between 15% and 75%; PL is in 10-17% of normal subject and in 43% of patients with multinodular goiter. The PL is of great importance to the thyroid surgeon during thyroidectomy: it is crucial to look for, identify, and remove the PL, as this can be a cause of incomplete resection of the gland. If left behind in a patient who will require postoperative radioactive iodine, its presence will virtually nullify the anticipated benefit of I^{131} by absorbing most of the radioactive material; may exist relapse of cancer from PL left in situ.*

Conclusions. *The intraoperative frequence of PL is 12%, and it is considered a normal component of the thyroid. Scintigraphic visualization of the PL depends on the kind of thyroid disorder and on the experience of radiologist, so the PL can often not be diagnosed by scintigraphic imaging. Finally, the whole anterior cervical region has to be investigated very carefully during thyropidectomy not to overlook a long or thin pyramidal lobe or other ectopic thyroid tissue because actually doesn't exist the goldstandard preoperative method to diagnoses PL.*

RIASSUNTO: **L'importanza del lobo piramidale in chirurgia tiroidea.**

G. GERACI, F. PISELLO, F. LI VOLSI, G. MODICA, C. SCIUMÈ

Introduzione. *Il lobo piramidale (LP) è un residuo embriologico del dotto tireoglosso; la sua incidenza varia dal 15 al 75% dei casi, ma tutti i dati presenti in letteratura sono limitati a evidenze autoptiche e radiologiche preoperatorie. Scopo del nostro studio è evidenziare la reale frequenza intraoperatoria e le correlazioni anatomocliniche dell'LP.*

Pazienti e metodi. *Tra il 1999 ed il 2007, presso la Sezione di Chirurgia Generale ad Indirizzo Toracico del Policlinico Universitario di Palermo, sono state eseguite 604 tiroidectomie totali. La incidenza intraoperatoria di LP è stata del 12% (57% maschi, 43% femmine, età media 42.5 anni), ma solo il 50% circa era stato evidenziato in fase preoperatorio con la ecografia (4% di falsi positivi) o con la scintigrafia (8% di falsi positivi).*

Risultati. *Nel 77% dei casi l'LP era affetto da patologia nodulare in gozzo multinodulare, nel 12.3% da carcinoma papillifero, mentre era normale nei restanti casi. Nel 96% dei casi originava dalla parte sinistra dell'istmo e nel 25% dei casi era associato al linfonodo delfico. Nessun LP è risultato essere più lungo di 2 cm alla valutazione istopatologica. Non abbiamo riscontrato differenze significative nella durata della tiroidectomia con e senza LP. Al follow-up ecografico, scintigrafico e laboratoristico (2 mesi-8 anni) non abbiamo mai evidenziato resezioni incomplete o recidive correlabili alla permanenza di residui di LP.*

Discussione. *In studi anatomici la frequenza di LP varia tra il 15 ed il 75%; l'LP è comunque presente nel 10-17% di soggetti con tiroide normale e nel 43% dei pazienti affetti da gozzo multinodulare. L'LP è di grande importanza durante la chirurgia della tiroide: è fondamentale ricercarlo, evidenziarlo e rimuoverlo in blocco con la tiroide per evitare resezioni incomplete che potrebbero portare ad inefficacia della terapia con I^{131} o a recidiva tanto di patologia benigna quanto maligna.*

Conclusioni. *Dal nostro studio, l'incidenza intraoperatoria di LP (che va comunque considerato un normale componente della tiroide) è del 12%. La corretta visualizzazione scintigrafica dipende dalla patologia di base della tiroide e dall'esperienza dell'ecografista. Infine, in fase intraoperatoria, l'intera regione cervicale anteriore va attentamente ispezionata allo scopo di evidenziare (e rimuovere) tanto un piccolo LP quanto eventuali tiroidi accessorie o aberranti, potenziali sede di recidiva.*

Università degli Studi di Palermo
Sezione di Chirurgia Generale ad Indirizzo Toracico
(Direttore: Prof. G. Modica)

KEY WORDS: Pyramidal lobe - Scintigraphy - Thyroidectomy.
Lobo piramidale - Scintigrafia - Tiroidectomia.

Introduction

Although the anatomy of the thyroid has exactly been studied, the occurrence of accessory thyroid tissue is still not clearly defined in literature. Description of the incidence of a pyramidal lobe (PL), an embryological remnant of the thyro-glossal duct, varies from 15% to 75% and data concerning its size are lacking (1).

The aim of our study is to elucidate the frequency, location and surgical management of the PL.

Patients and methods

Between December 1999 and July 2007, 604 total thyroidectomy were performed in Unit of General and Thoracic Surgery in University Policlinico of Palermo.

The intraoperative incidence of PL was 12% (74 cases), in concordance with latest literature data, but only 15 (20%) were identified preoperatively with ultrasonography (US) and 23 (31%) with Tc-99m pertechnetate scintigraphy. US and scintigraphy reported false positive in 3 (4%) and 6 (8%) cases respectively, related to hypertrophy of isthmus (the lobes could hardly be identified), confirmed at surgery.

Of 74 patients with PL, 42 were male (57%) and 32 were female (43%), with no statistical difference. Mean age was 42.5 years (range 21-67 years). Of these 74 PL, 57 (77%) were affected by nodular pathology in multinodular goiter and only 1 (1.3%) was involved by primitive neoplastic pathology (papillary cancer).

Results

There was no difference in thyroidectomy operative time with or without PL.

In 19 cases (25%) PL was associated with the presence of delphian lymph node, site of metastasis from papillary cancer in the single case of papillary cancer reported in our experience.

In our experience, PL branched off more frequently from the left part of the isthmus (71 cases, 96%) than from the right part (3 cases, 4%). No PL exceeded 2 cm in length in pathologic specimen.

At US, scintigraphic and laboratory follow-up (from 8 years to 2 months) no incomplete resection of the gland related to the presence of PL were recorded.

Discussion

The PL (*lobus pyramidalis glandulae thyroideae*, Lalouette's pyramid, Morgagni's appendix, pyramid of thyroid) is a vestigial remnant of the thyroglossal tract. Let's recall that the thyroid gland embryologically descends in the midline from the foramen caecum at the base of the tongue down to its final resting place low in the anterior neck.

The embryonic thyroid tissue appears about 24 days after fertilization on the border between the first and second branchial arch. It starts as an endodermal thickening in the floor of the pharynx, forming a pouch called the thyroid diverticulum. First, the diverticulum is hollow but soon becoming solid. The developing thyroid descends down to the neck, towards its definitive site. During this period it is in close contact to the tongue by the thyroglossal duct. By the end of the seventh week the thyroid gland has assumed its adult shape and location. By this time it has also lost its fusion to the tongue, because the thyroglossal duct degenerates, usually starting in the middle. The origin of the thyroid primordium persists as the foramen caecum of tongue. On the way down some thyroid tissue may remain somewhere along the thyroglossal duct or even continue descending further down. These remnants are the origin of different thyroid anomalies such as ectopic thyroid glands or thyroglossal cysts and fistulae. The embryonic thyroid gland can also fail to descend resulting in a lingual thyroid, usually causing dysphagia. A PL represents the inferior part of the thyroglossal duct and may be attached to the hyoid bone by a fibrous or muscular cord (2).

In the study of Braun and coworkers, 58 cadaveric specimens were examined with special emphasis to the topographical anatomy and expansion of the PL, that was found in 32 cadavers (55%). It was found more frequently in men (62%, median length was 14 mm) than in women (50%, median length was 29 mm), without statistical significance.

The PL branched off more frequently from the left part of the isthmus (16/32 = 50%) than from the right (7/32 = 22%) or the midline (9/32 = 28%). In two cases it originated from the left lobe (1).

Literature gives varying information about thyroid anomalies. In anatomical studies the frequency of the PL is between 15 and 75% (Tab. 1).

The PL is of great importance to the thyroid surgeon for several reasons. First, when performing total thyroidectomy for Graves' disease, it is crucial to look for identify and remove the PL, as this can be a cause of recurrent hyperthyroidism following an incomplete resection of the gland. Second, it can be the site of origin of

TABLE 1 - INCIDENCE OF PYRAMIDAL LOBE IN LITERATURE.

Author, year	%	Study methodology
Marshall, 1895	43	Autoptic
Zuckerkandl, 1915	60-70	Autoptic
Testut-Streckeisen, 1915	75	Autoptic
Oseki, 1915	72	Autoptic
Lanz, 1955	>50	Autoptic
Izenstark, 1968	35	I^{125} Spintharicon
Romanes, 1981	40	Autoptic
Blumberg, 1981	60-65	Autoptic
Levy, 1982	43	Scintigraphy
Savage, 1984	25	Tc-99m pertechnetate scintigraphy
Leonhard, 1987	30	Autoptic
Frick, 1987	50	Autoptic
Bergmann, 1988	40-68	Autoptic
Skandalakis, 1989	50	Autoptic
Richard,1997	36	Tc-99m pertechnetate scintigraphy
Wahl, 1997	81	I^{123} scintigraphy
Thews, 1999	>15	Autoptic
Lippert, 2000	50	Autoptic
Wohn, 2002	77	Autoptic in Koreans
Benninghoff, 2004	30	Autoptic
Braun, 2007	55	Autoptic
Braun, 2007	13	Tc-99m pertechnetate scintigraphy
Personal experience, 2008	**12**	**Intraoperative**

a thyroid cancer or contain intraglandular metastasis or multifocal disease, especially in cases of papillary carcinoma. Next, if left behind in a patient who will require postoperative radioactive iodine, its presence will virtually nullify the anticipated benefit of I^{131} by absorbing most, if not all, of the radioactive material. Finally, this midline structure may harbor the Delphian lymph node, not infrequently the site of metastasis from a cancer in the body of the thyroid gland (2).

Visualization of the PL in scintigraphic images is of much interest, especially if total removal of the thyroid is indicated. Reliable preoperative diagnosis of a PL would aid the surgeon finding all thyroid tissue.

Wahl and cowokwers performed a study including 349 scintigrams and thyroid remnants were found in 126 patients; they noted PL in 81% (17/21) of the patients with Grave's disease but only in 7% of the patients with functional autonomy. A control group

without any thyroid disorder showed a percentage of 36%. In 53% of the patients the PL was found on the left, in 39% on the right, and in 8% of the patients it was found in the midline. Furthermore, it was more easily detected using I-123 instead of Tc-99m pertechnetate (3).

No data concerning the length of the PL are in literature. In the survey of Braun and coworkers, the PL exceeded 2 cm in 51.6% of the cases. Especially very long ones showed to be quite thin, in fact all lobes that reached the cranial border of the thyroid cartilage were less than 5 mm in diameter (1).

However, 10% to 17% of normal subjects and patients with various thyroid disease states had a pyramidal lobe on their scans and 43% of patients with diffuse toxic goiter had a pyramidal lobe on the thyroid images. There appears to be a correlation between elevated thyroid function studies (likely in thyroid mass) and the incidence of a pyramidal lobe on thyroid scans in diffuse toxic goiter (4).

In the study of Léger and coworkers, 3 of first degree asymptomatic relatives of 84 children and newborn with congenital hypothyroidism presented PL (4%), on a total of 21 thyroid developmental anomalies; these data support the hypothesis, according the Authors conclusions, that there is a common genetic component of the disorder with heterogeneous phenotypes (5).

Conclusions

Our study, the first in literature on intraoperative observation, showed that the PL occurs in 12% of thyroid with benign or malign pathology and should therefore be regarded as a normal component of the thyroid. Incidence of a PL seems to have a slight tendency towards the male gender and it arises more frequently from the left than from the right side or the midline.

Scintigraphic visualization of the PL depends on the kind of thyroid disorder and on the experience of radiologists, so the PL can often not be diagnosed by scintigraphic imaging. This has to be taken into account in order not to leave residual thyroid tissue in total thyroidectomy.

Therefore the whole anterior cervical region has to be investigated very carefully during operation not to overlook a long or thin pyramidal lobe or other ectopic thyroid tissue because actually doesn't exist the gold-standard preoperative method to diagnoses PL.

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