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editorial

Thyroid resurgery

M. R. PELIZZO

Resurgery on the thyroid is commonly considered a challenge even for skilled surgeon because of the higher risk of complications by comparison with primary surgery, and such procedures are generally feared, irrespective of their complexity, simply because they are re-operations. Much of this concern is based on historical findings and outdated retrospective analyses covering lengthy periods of time, during which technical refinements were introduced and there were advances in our knowledge, making the reported case series difficult to compare in terms of the types of procedure and the surgical techniques involved, the diseases being treated, and the criteria used to assess complications.

It is essential to specify that the term resurgery includes various procedures, ranging from minimal operations to extensive, complex surgical interventions from the technical standpoint and/or depending on the type of disease involved. The confusion deriving from such different procedures being grouped together can give rise to false messages and be misleading for the thyroid surgeon, and even more so for other physicians and patients.

This situation has influenced surgeons' attitudes recent decades, making them tend to opt (not always justifiably) for more radical primary surgical procedures, regardless of the nature and extent of the thyroid disease and the patient's age. Considering so-called elective total thyroidectomy as a policy for actively preventing recurrences (estimated to occur in around 14-43% of cases) - even in patients with a single, benign node - has not met with unanimous approval, however, given that lobectomy is safer and has the advantages of placing only one recurrent nerve at risk, causing no hypoparathyroidism, and possibly making hormone replacement therapy unnecessary (1).

As a minimal approach to thyroid disease, lobectomy (tracing and preserving the recurrent nerve and parathyroid glands) is acknowledged as being a marked improvement over the limited, blind resections that were once in vouge (and responsible of difficult reoperations and a number of sequelae). It is also important to mention the parallel contribution of ultrasonography and FNA-cytology in preventing subsequent resurgery, since they enable us to distinguish cases that are rightfully candidates for lobectomy from patients with carcinomas or benign but bilateral disease, that we would all agree warrant radical thyroidectomy (2).

It is taken for granted that lobectomy carries fewer risks but exposes patients to the risk of recurrences, though not everyone seems to realize that any exclusively contralateral resurgery after lobectomy is tantamount to a primary procedure (3).

It therefore seems worthwhile to mention a few points on the issue of resurgery, starting with an outline of the procedures involved and adding a few technical recommendations based on a lengthy, intensive experience of thyroid surgery.

University of Padua, Italy
Department of Medical and Surgical Sciences
Unit of Special Surgical Pathology

Outline

Resurgery on the thyroid can be divided between elective **totalizing** operations warranted by a postoperative diagnosis of carcinoma and procedures for **benign and malignant recurrences** of thyroid disease, but the main distinction is drawn between **mono-** and **bilateral procedures**.

Elective totalizing surgery

The goal of elective totalizing surgery is to eliminate the residual normal thyroid tissue after subtotal thyroidectomy when the final histological examination has generated a diagnosis of differentiated carcinoma, i.e. mainly to enable the use of 131-I as a complementary therapy. Contralateral lobectomy in a virgin field is absolutely the most favorable and safest resurgical procedure, providing the initial lobectomy has been done properly. Inflammatory or bleeding complications relating to the first operation, or simply the sequelae of intraoperative exploration of the healthy lobe, can nonetheless interfere with the contralateral totalizing procedure. That is why it is always best to avoid unnecessary contralateral explorations and, whenever possible, two-stage elective surgery, which is also disagreeable from the psychological and esthetic standpoints. The completion of a thyroidectomy is either done straight away, during the same hospital stay, or it can be deferred for 3-4 months, after the tissue repair process is complete. Bilateral totalizing surgery (after lobectomy has unwisely not been performed during primary surgery, so reoperation involves completing the thyroidectomy on the ipsilateral side too!) is more troublesome. The difficulty of ipsilateral resurgery is paradoxically inversely proportional to the extent of the residual thyroid, that acts as a sort of "cushion" between the prethyroid muscles and the laryngo-tracheal plane (which would otherwise be tenaciously fused), facilitating the dissection. That is why it is worth considering 131-I treatment as an alternative to surgery if the thyroid remnant is of modest extent and echographically normal. Resurgery for bilateral totalizing thyroidectomy is even more of a worry when the initial partial thyroidectomy has involved both the lobes, in which case it is particularly advisable to consider scintigraphy and nuclear medical assessment before going for the surgical option.

Resurgery for recurrences

Thyroid resurgery for recurrent thyroid disease must first be distinguished according to the malignant or benign nature of the recurrence.

For **malignant cases,** the main issue is the carcinoma's stage and any extra-thyroid dissemination becomes especially important. After total thyroidectomy, recurrences generally occur in the lymph nodes - unless the initial surgery was not sufficiently radical (but this issue goes beyond the scope of the present discussion). After subtotal thyroidectomy, whether the primary disease was benign or already malignant, resurgery promises to pose relatively few problems if it involves a contralateral lobectomy alone, but to be far more troublesome if it also requires ipsilateral completion, given the previous surgical manipulation.

In any case, it is the mono- or bilateral nature of resurgery (be it for malignant or benign disease) that most heavily influences the related risk, even when the resurgical procedure per se does not appear to be particularly complex. This risk is usually (though not always rightly) easier to justify and more readily accepted if the nature of the recurrence is malignant.

In the case of **benign recurrences**, after bilaterality, there may be the anatomical shape, topographical location and functional behavior of the recurrence coming a close second on the surgical difficulty and related risk scale (and counting even more than a malignant nature), as in the case of a bulky goiter extending retro-tracheally, scarf-like or mediastinally, especially if there are signs of thyroiditis or vascularization, as in Basedowian or Basedowized hyperfunctioning goiter. Here the technical complexity is understandably greater than for straightforward elective totalizing lobectomy. The operation is currently seen as a case of "generic resurgery", however, because it is used to deal with benign disease and this means that any sequelae are more difficult to accept, even though they may be more justified.

However difficult resurgery may seem, monolaterality is always a great relief for surgeons given the delicate task of re-operating the patient because it eliminates the risk of bilateral recurrent nerve paralysis, which is a severe complication of thyroid surgery, even in the fortunate cases in which vocal cord abduction requires no tracheostomy. Bilateral paralysis is luckily a rare event, but it

is always a worry even in cases of primary bilateral thyroidectomy and, together with hypoparathyroidism, this risk supports the opinion of those who are against elective total thyroidectomy even for monolateral or benign disease.

The best way to avoid needing bilateral totalizing surgery and re-exposing patients to the risk of transient or permanent anatomical and functional damage to the recurrent nerve and residual parathyroids on both sides is to systematically perform a lobectomy proper in the first instance … to avoid having to retrace our steps. It is also a good idea to scrupulously preserve the parathyroids and vascularization with a view to ensuring the best outcome of any hypothetical resurgery. In benign recurrences the decision to reoperate must be carefully weighed according to its overall clinical impact, not just of the procedure itself, without adopting excessively lengthy wait-and-see policies, but not taking an indiscriminate interventionist attitude either. Cases for resurgery must be selected not on the basis of generic subjective symptoms, but on documented, objective evidence of compressive discomfort, increase in size, hyperthyroidism, as well as the patient's age and general risk factors. The indication for surgery and the related risk must be pondered even more carefully for patients found to have cord paralysis, and video-laryngoscopy consequently takes prime of place in the assessment of patients for resurgery. The risk of this complication recurring is only eliminated in the fortunate case of the recurrence being ipsilateral to the paralyzed cord and, even when this is the case, it is always a good idea to respect the paralyzed recurrent nerve if it is anatomically intact. The technique substantially follows the same steps and – subject to the needs of radicality and accurate hemostasis - it applies the same hierarchical criteria in preserving the functional structures, the recurrent inferior laryngeal nerves, the parathyroids and, where possible, the external branches of the superior laryngeal nerves too.

Technical considerations

Recervicotomy

Generally speaking, a second parallel cervicotomy is avoided, but the primary incision is used, usually removing the scar. To facilitate dissection of the platysma-cutaneous flaps in the optimal plane, it is useful to work slightly laterally to the scar, even on one side only, so as to access a virgin field and so that the detachment leaves the superficial cervical fascia adhering to the prethyroid muscles. If the incision required is smaller and it is not necessary to remove the scar, then its extension will depend on the volume of the recurrence.

Access to the loggia

There are two options. One is the traditional medial route, along the sutured linea alba. Adhesions of the linea alba and prethyroid muscles to the tracheal plane sometimes make it inaccessible, however, or accessible only at the expense of a troublesome blood loss that may flood the surrounding tissue and subsequently interfere with the identification of the recurrent nerve and parathyroid. The other option is a lateral access, i.e. a route lateral to the prethyroid muscles, the lateral edge of which is isolated after detaching them from the ipsilateral sternocleidomastoid muscle and lateralizing the homohyoid (4). If no resection of the prethyroid muscles is required, the vessel-nerve stump is preserved to avoid its atrophy giving rise to an unsightly asymmetry of the neck (Fig. 1).

Prethyroid muscle resection/section

Enbloc resection of the prethyroid muscles together with the lobe becomes necessary, when they are firmly fused with the thyroid remnant, to avoid the dissection extending into the thyroid parenchyma, or for reasons of radicality in cases of carcinoma (especially if the muscles appear to be infiltrated). This resection may, however, be restricted to just the sternothyroid muscle (which is in direct contact with the thyroid), preserving and laterally mobilizing the sternohyoid muscle (this is facilitated by its insertion higher up) with a view to preventing unsightly and uncomfortable adhesions forming between the trachea and the subcutis. Where the prethyroid muscles are dissected between two Kocher clamps, which it is a good idea to keep in place to facilitate the closure and stitching, the level is adjusted to avoid damage to the vessel-nerve stump, which would influence its trophism.

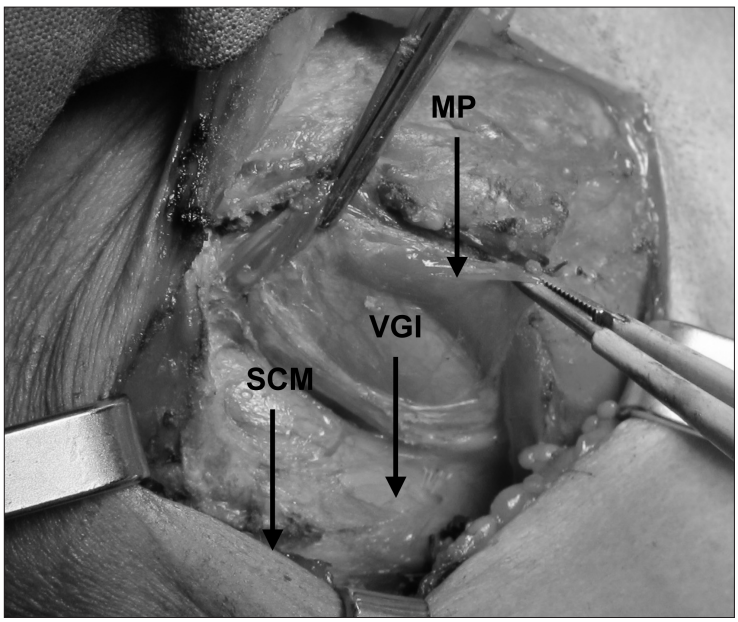

Fig. 1 - Lateral access. Once the SCM muscle has been separated from the prethyroid muscles, the jugular vein is identified. Displacing the prethyroid muscles medially enables exposure of the common carotid artery.
VGI = jugular vein
SCM = sternocleidomastoid muscle
MP = prethyroid muscles

Preserving the recurrent nerve

Using the lateral access, the internal jugular vein located immediately below the homohyoid tendon is a good pointer (partly because of its color) to the common carotid, which is a key anatomical element in the more complex surgical procedures, irrespective of whether a medial or lateral approach is adopted. Parallel and medially to its trunk, the medial cervical fascia is cut to reveal the inferior thyroid artery (recognizable from its initially descending and subsequently transverse course, and its pulsatility). The inferior thyroid artery stems from the thyroid-facial trunk and passes behind the carotid, extending transversely to the thyroid and separating into more or less slender branches before it is distributed to the thyroid and parathyroids. It is sometimes useful to place an elastic traction band around it, near the carotid (Fig. 2), to facilitate the identification of the recurrent nerve crossing over it. This maneuver is effective in subtending the nerve and delineating its route, especially if the nerve has a pre-vascular course. If necessary, for hemostatic purposes, the artery can be

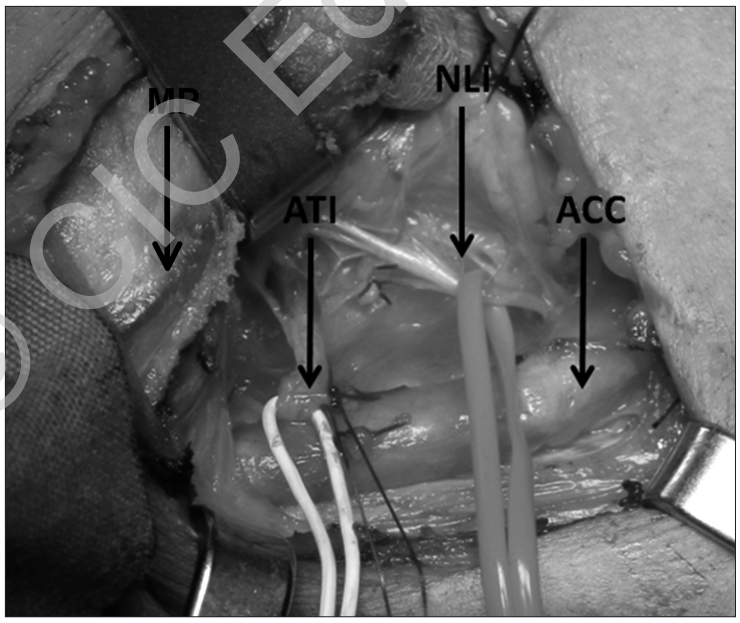

Fig. 2 - Lateral access to the thyroid bed (prethyroid muscles are displaced by the Farabeuf): the subtended inferior thyroid artery improves exposure of the recurrent nerve.
NLI = Recurrent laryngeal nerve
ACC = Common carotid artery
ATI = inferior thyroid artery
MP= Prethyroid muscles

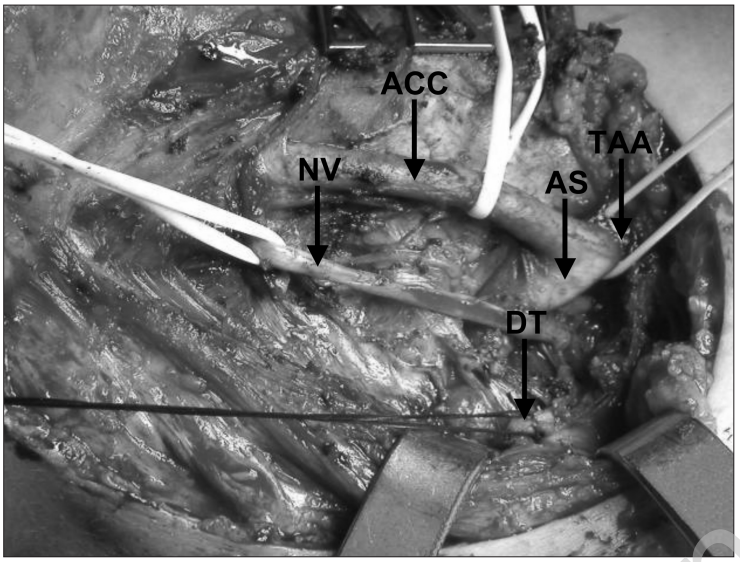

Fig. 3 - Access to the thyroid bed laterally the prethyroid muscles, displaced medially with the triangular pliers.
ACC = Common carotid artery
NVc = Vagus
AS = Subclavian artery
TAA = Innominate artery
DT = Thoracic duct

ligated or occluded, even only temporarily, by pulling on the band. The bloodless field facilitates the identification of the parathyroids and recurrent nerve, but before ligating the artery it is best to get a glimpse of the recurrent nerve, which is known to have a very variable course. Otherwise it is wise to surround the artery on a level with its wall and laterally as far away from the thyroid as possible, up against the carotid, to avoid loading the nerve as well as the artery in the process (Fig. 3).

The recurrent nerve should be sought where it emerges from the mediastinum, continuing the search as far down as possible where the planes are still intact, rather than closely to the thyroid remnant (to which the nerve may be attached with more or less tenacious adhesions). Once it has been identified, the recurrent nerve can be mounted on an elastic loop and, with the aid of mild traction, dissected up to where it enters the larynx. If the nerve is firmly attached to the remnant, it becomes necessary to cut medially into the thyroid capsule to release the nerve and gently cleave it from the thyroid on the tip of the scalpel or scissors. On rare occasions the inferior thyroid artery may not be identifiable and an associated nerve anomaly becomes a concern: the best known being a case of the inferior laryngeal nerve not "recurring". Sometimes it is impossible to see the inferior laryngeal nerve emerging from the usual mediastinal site and, when this anomaly is suspected, it is best not to perform any ligature or section without first identifying the vagal trunk, which is medialized in relation to the carotid in such cases, as if it had been stretched medially by the shorter and more direct "non-recurrent" nerve. The non-recurrent inferior laryngeal nerve originates directly from the cervical stretch of the vagus, becoming associated with a right aberrant subclavian artery stemming as the last branch of the aortic arch and extending rightwards with a retro-esophageal course. Over its transverse course, the laryngeal nerve resembles an inferior thyroid artery, but it is more flaccid and does not pulse. Sometimes it runs around the inferior thyroid artery instead, but always with an exclusively cervical origin and course. In an even rarer variant, however, the non-recurrent laryngeal nerve branches away from the vagus even higher up, coming close to the elements of the superior peduncle (Fig. 4).

Tracheal wall

The pre-tracheal plane of cleavage may be difficult to identify if thyroid remnants have been anchored to it with hemostatic stitches. Here again, it is a good idea to seek the plane at the cervicomediastinal interface, preferably where it is still untouched, and to move along the pre-tracheal fascia. If the tracheal wall is accidentally damaged, it can be repaired with a few resorbable stitches, accurately juxtaposing the prethyroid muscles if they have been preserved.

Preserving the parathyroids

The problem of preserving the parathyroids is more complicated and the outcome less reliable because we start with an unknown number of residual parathyroids, even after monolateral primary

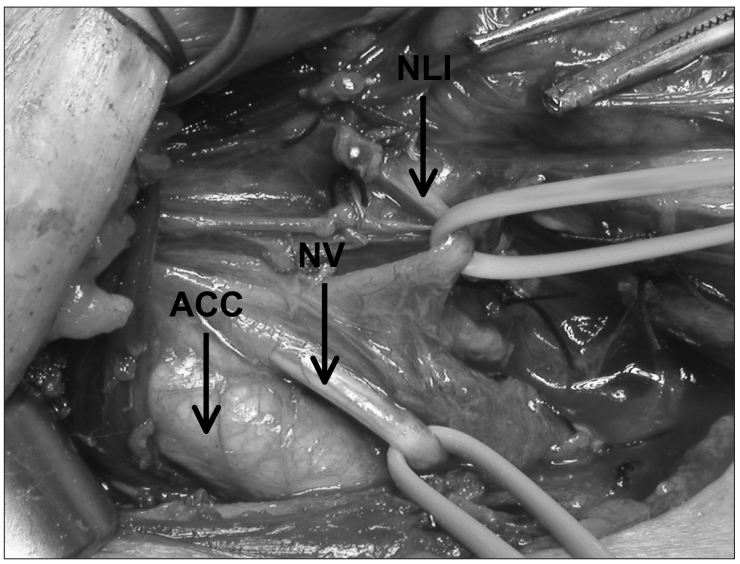

Fig. 4 - Non-recurrent inferior laryngeal nerve
NLI = Inferior laryngeal nerve
ACC = Common carotid artery
NV = Vagus

surgery. Because their function is easy to replace with pharmacological therapy, the parathyroids take third place on the thyroid surgeon's list of priorities so, although they are paid the utmost attention, priority will go to hemostasis and the recurrent nerves. In addition, even the most accurate technique for the anatomical preservation of the parathyroids cannot absolutely guarantee their functional integrity. The chamois color, the adipose capsule, and the arteriole-stem from which they hang are changeable in appearance and the parathyroids may also be hidden between the thyroid nodes or lymph nodes, or even harbored inside the thyroid. Where subverting the planes fails to enable their reliable identification, the conventional pointers should be considered, preserving all structures adjacent to the thyroid. Parathyroids that are removed, accidentally or for the purposes of radicality, are immersed in freezing water to consolidate them and then sliced into minimal sections and placed in a pocket in the sternocleidomastoid muscle. The elective reimplantation of the parathyroid glands, systematically harvesting them ex vivo, has been suggested as an alternative to preservation in situ, however the successful grafting of a normal parathyroid is impossible to predict or ascertain. All parathyroids are generally fed by the inferior thyroid artery; less frequently the superior ones are fed by the superior thyroid artery, or by an anastomotic loop between the two arteries; that is why it is good practice to ligate the inferior thyroid artery not around the trunk (unless it is strictly necessary), but only at its terminal branches beyond the parathyroid; nor should the posterior branch of the superior thyroid artery be ligated without checking first whether the corresponding superior parathyroid is "hanging" from it. Parathyroid trauma can be reduced by using modern "cut-and-seal" dissectors that seem to carry a lower risk of ischemia or separation of parathyroids found "sticking" to the thyroid and difficult to cleave.

Reconstruction of the planes must be meticulous to avoid (as best we can) adhesions forming between the cutaneous and tracheal planes, which are not only unsightly, but also interfere with swallowing and extending the head. Redon suction drainage completes the procedure, even in cases where hemostasis is satisfactory.

Conclusions

Resurgery on the thyroid, irrespective of the nature of the recurrent disease, is always less difficult when primary thyroid lobectomy has been done properly because, if subsequent surgery only needs to be contralateral, then only one recurrent nerve is at risk and we have the advantage of knowing that the contralateral nerve will remain intact. This means that there should be no exceptions to lobectomy, where this is justified as a minimal treatment. The above considerations support the choice of this conservative procedure rather than elective total thyroidectomy (which exposes patients

to hypoparathyroidism, places both the nerve at risk, and makes hormone replacement therapy necessary), even if lobectomy carries a risk of disease recurrence. There are no longitudinal studies in the literature describing the percentage of recurrences after lobectomy for certainly isolated, benign nodes, or the percentage of reoperations needed to deal with such recurrences. Total thyroidectomy is advisable for benign bilateral disease, and mandatory for carcinoma, and that is why an accurate preoperative work-up is essential to distinguish between cases of monolateral and bilateral disease, and every effort must be made to diagnose its nature.

On the whole, recent works on iterative thyroid surgery seem to indicate that the problem of complications is not as severe as it was, e.g. recurrent nerve paralysis reportedly occurred in 17% of patients in the 1960s (Beahrs 1963, on 548 cases mentioned by Chao Tzu 5,6), but has since dropped to less than 2% (Calabro 1988, Chao Tzu 1997, Lefevre 2007 7,6,8,9), and even to nil, with a 5% rate of transient paralysis (Pasieka 1992, on 60 completion thyroidectomies for carcinoma 10). As for the parathyroids, it is comforting to read Lefevre's paper from 2007, which reports 5% of transient and 1.7% of permanent hypoparathyroidism among 685 patients undergoing resurgery over a period of 14 years. It is worth making the point, however, that these data underestimate the real incidence of complications in outside the main referral hospitals.

References

1. Campana FP. Single thyroid nodule. G Chir 2007 ; 28 (10): 353-5.
2. Di Matteo G, De Antoni E. Goiter surgery. Ann Ital Chir. 1996; 67(3):335-40.
3. Seiler CA, Vorburger SA, Bürgi U, Candinas D, Schmid SW. Extended resection for thyroid disease has less operative morbidity than limited resection. World J Surg 2007; 31: 1005-1013.
4. Pelizzo MR, Toniato A, Briguglio E. Lateral access in thyroidectomy: techniques and indications. Minerva Chir 1993; 48: 189-91.
5. Beahrs OH, Vandertoll DJ. Complications of secondary thyroidectomy. Surg Gynecol Obstet. 1963;117: 535-539.
6. Chao TC, Jeng LB, Lin JD, Chen MF. Reoperative thyroid surgery. World J Surg 1997; 21:644-647.
7. Calabro S., Auguste LJ, Attie JN. Morbidity of completion thyroidectomy for initially misdiagnosed thyroid carcinoma. Head and Neck Surg 1988 10(4): 235-8.
8. Lefevre JH, Tresallet C, Leenhardt L, Jublanc C, Chigot JP, Menegaux F. Reoperative surgery for thyroid disease. Langenbecks Arch Surg 2007; 392: 685-691.
9. Menegaux F, Turpin G, Dahman M, Leenhardt L, Chadarevian R, Aurengo A, du Pasquier L, Chigot JP. Secondary thyroidectomy in patients with prior thyroid surgery for benign disease: a study of 203 cases. Surgery 1999; 125: 479-483.
10. Pasieka JL, Thompson NW, McLeod MK, Burney RE, Macha M. The incidence of bilateral well-differentiated thyroid cancer found at completion thyroidectomy. World J Surg 1992; 16: 711-717.