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Recurrent Laryngeal Nerve Palsy Following Thyroid Surgery: A Retrospective Analysis of 100 Cases

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ABSTRACT

Introduction: Recurrent laryngeal nerve paralysis is one of the most feared complications of thyroid surgery due to its functional repercussions on phonation, respiration, and patients quality of life. Despite advances in surgical techniques and improved anatomical knowledge, the risk of nerve injury persists. The objective of this study was to assess the frequency of recurrent laryngeal nerve palsy after thyroid surgery and to identify factors that may influence its occurrence.

Materials and Methods: This was a retrospective study conducted in the ENT head and neck surgery department in 20 august hospitals involving 100 patients operated for thyroid pathology. Demographic, clinical, surgical, and outcome data were collected from medical records and direct patient interviews. All patients underwent laryngeal assessment by nasofibroscopy, allowing analysis of vocal cord mobility at rest and during phonation. Data were analyzed using SPSS software.

Results: The study population was predominantly female (84%) with a mean age of 50 years. Total thyroidectomy was the most frequently performed procedure (80% of cases). Histopathological examination revealed benign pathology in 55% of cases and malignant pathology in 45% of cases, predominantly papillary carcinoma. Vocal cord paralysis was observed in 8% of patients. Involvement was predominantly right-sided (75%) and remained asymptomatic in nearly half of cases. Postoperative dysphonia was the main clinical symptom. Analysis of associated factors showed a higher frequency in patients with malignant pathology and in procedures performed in a training context.

Discussion: Recurrent laryngeal nerve palsy remains a significant complication of thyroid surgery, with variable incidence in the literature. In our series, the observed rate remains comparable to that reported in several international studies. The occurrence of this complication depends on multiple factors, including the extent of surgery, the nature of the thyroid pathology, and surgeon experience. Systematic identification of the recurrent laryngeal nerve and mastery of surgical technique are essential elements for reducing the risk of nerve injury.

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Introduction

Thyroid surgery is a common procedure in cervico-endocrine surgery, but it remains associated with several postoperative complications, including hemorrhage, hypoparathyroidism, and recurrent laryngeal nerve injuries, which account for a significant portion of postoperative morbidity [1,2].

Among these complications, recurrent laryngeal nerve palsy holds a particular place due to its potentially severe functional repercussions, which can significantly impair patients' quality of life. It most often manifests as dysphonia related to incomplete glottic closure, but may also be accompanied by respiratory or swallowing disorders [3,4].

Historically, the earliest series of thyroid surgery reported high rates of recurrent laryngeal nerve palsy, reaching up to 32% in the 19th century. The progressive improvement of surgical techniques, particularly the systematic identification of the nerve during dissection, has significantly reduced this incidence, which currently varies between 0.5% and 5% according to different series [5,3].

Despite these advances, recurrent laryngeal nerve palsy remains a feared complication of thyroid surgery. Its occurrence depends on numerous factors such as the nature of the thyroid pathology, the extent of the surgical procedure, the surgeon's experience, or the presence of revision surgery [6,7].

In this context, evaluating the frequency of recurrent laryngeal nerve palsies and identifying associated risk factors constitute major challenges for improving the prevention and management

of this complication. The objective of this work is therefore to study the prevalence of recurrent laryngeal nerve palsy after thyroid surgery and to analyze the factors that may influence its occurrence.

Materials and Methods

Study Type and Population

This was a retrospective observational study conducted in the ENT head and neck surgery department of 20 august hospital of Casablanca. The study included a series of patients operated for thyroid pathology who either presented with or without recurrent laryngeal nerve palsy in the postoperative period.

The study population comprised 100 patients who underwent thyroid surgery. Demographic, clinical, paraclinical, therapeutic, and outcome data were analyzed.

Data Collection

Data collection was carried out using two complementary methods. First, patients were scheduled for a direct clinical interview to collect information regarding vocal and respiratory symptoms, as well as quality of life. Second, data were supplemented by reviewing hospital medical records.

All information was collected using a standardized data collection form, including epidemiological data, clinical characteristics, results of complementary examinations, therapeutic modalities, and postoperative patient outcomes.

Laryngeal Assessment

All patients included in the study underwent laryngeal nasofibroscopy as part of the functional assessment. This examination enabled morphological and dynamic analysis of the vocal cords during both respiration and phonation on a sustained vowel ("i").

The assessment was based on several parameters: vocal cord position (adduction, paramedian, intermediate, or abduction), presence of glottic leakage during phonation, appearance of the vocal cord free edge, voice quality, and analysis of respiratory pattern.

Statistical Analysis

The collected data were entered and analyzed using SPSS software, in collaboration with the medical informatics laboratory of the Faculty of Medicine and Pharmacy of Casablanca. Statistical analysis enabled description of the study population characteristics and evaluation of the various clinical and outcome parameters related to postoperative recurrent laryngeal nerve palsy.

Results

Population Characteristics

Our study included 100 patients who underwent thyroid surgery. The population was predominantly female with 84 women and 16 men, yielding a sex ratio of 0.19. The mean age was 50 years (range: 16-81 years). The most represented age group was 40-50 years (33%), and 63% of patients were aged between 40 and 60 years. Regarding occupational status, 89% of patients were unemployed, including 78% housewives. Geographically, 65% of patients resided in Casablanca.

Preoperative Clinical and Paraclinical Data

In our series, 88% of patients were asymptomatic. The remaining 12% presented with functional signs dominated by dysphonia (5%), dyspnea (2%), dysphagia (2%), or a combination of symptoms (3%). Cervical examination revealed a solitary nodule in 50% of cases, multinodular goiter in 12% of cases, diffuse thyroid enlargement in 8 patients, large goiter in 3 patients, and retrosternal goiter in 2 patients.

Multinodular goiter was the main surgical indication (88%), followed by solitary nodule (6%), retrosternal goiter (3%), and large goiter (2%). Preoperative nasofibroscopy, systematically performed in all patients, was strictly normal in all cases, showing no vocal cord mobility abnormalities. Fine-needle aspiration, performed in 12 patients, revealed benign Bethesda II lesions (17%), suspected malignancy Bethesda IV (42%), follicular neoplasia Bethesda IV (33%), and follicular lesions of undetermined significance Bethesda III (8%). All patients were euthyroid preoperatively. Cervical ultrasound showed multiple nodules in 81% of cases, a solitary nodule in 14% of cases, and large goiter in 3 patients.

Operative Data

Surgical procedures were performed by either experienced surgeons or residents in training under supervision. Operative procedures were distributed as follows: total thyroidectomy (80%), total thyroidectomy with lymph node dissection (2%), right lobectomy (12%), left lobectomy (4%), and complete thyroidectomy (4%). The recurrent laryngeal nerve was systematically identified and preserved with its sheath in all patients, with no particularities noted in the operative reports.

Histopathological Results

Histopathological examination revealed benign lesions in 55% of patients and malignant pathologies in 45%. Among carcinomas, papillary carcinomas accounted for 35% of the entire series.

Immediate Postoperative Outcomes

Postoperative course was uneventful in 55% of patients. Twenty-three cases of hypoparathyroidism (22%) were reported. Twenty-two patients (22%) presented with postoperative dysphonia, manifesting as hoarse voice (11 cases), vocal fatigue (10 cases), or diplophonia (1 case). Three patients (3%) presented with dysphagia to liquids.

Prevalence and Characteristics of Recurrent Laryngeal Nerve Palsy

Systematic postoperative nasofibroscopic examination revealed recurrent laryngeal nerve palsy in 8 patients, representing a prevalence of 8% in our series. No cases of bilateral palsy were observed.

- **Epidemiological Characteristics**
  Recurrent laryngeal nerve palsy affected 6 women (75%) and 2 men (25%). The mean age of affected patients was 50 years, all within the 40-60 year age range.
- **Laterality of Involvement**
  Right-sided involvement predominated markedly, affecting 6 patients (75%), while 2 patients (25%) presented with left vocal cord paralysis.
- **Clinical Correlations**
  Among the 8 patients with recurrent laryngeal nerve palsy, 4 (50%) experienced objective postoperative dysphonia, while the palsy remained asymptomatic in the other 4 patients (50%). Vocal fatigue was reported in 6 of these patients (75%).
- **Operative and Histological Correlations**
  All patients who developed recurrent laryngeal nerve palsy had undergone total thyroidectomy. Only one patient had

associated lymph node dissection. Three patients (36%) were operated on for thyroid carcinoma, although this association did not reach statistical significance (p=0.65). Regarding surgeon experience, 6 procedures (75%) were performed by residents in training and 2 (25%) by experienced senior surgeons.

Table 1: Characteristics of Patients with Recurrent Laryngeal Nerve Palsy (n=8)

Characteristic		Number (n)	Percentage (%)
Sex	Female	6	75%
	Male	2	25%
Age	Mean (years)	50	-
	Range 40-60 years	8	100%
Laterality	Right	6	75%
	Left	2	25%
Type of resection	Total thyroidectomy	8	100%
	Thyroidectomy with lymph node dissection	1	12.5%
Histology	Carcinoma	3	36%
	Benign	5	64%
Surgeon	Resident	6	75%
	Senior	2	25%
Symptomatology	Dysphonia	4	50%
	Asymptomatic	4	50%
	Vocal fatigue	6	75%

Discussion

Recurrent Laryngeal Nerve Palsy (RLNP) remains one of the most feared complications of thyroid surgery, potentially significantly impairing patients' quality of life [8,5]. Our cross-sectional study, conducted in 100 patients undergoing thyroid surgery, aimed to determine the prevalence of this complication in our practice and to analyze the associated risk factors. The 8% prevalence of recurrent laryngeal nerve palsy observed in our series falls within the upper range of data reported in the international literature, which varies between 0.5% and 14% according to different series [5,3,9]. This variability is explained in particular by the lack of standardization of postoperative screening, our study having included systematic nasofibroscopy in all patients, unlike many series where examination is only performed in the presence of symptoms [10,11].

Epidemiology and Risk Factors

Our population was characterized by a marked female predominance (sex ratio 0.19) and a mean age of 50 years, demographic data comparable to those of large series in the literature [7, 3,12]. The 40-60-year age group accounted for 63% of our patients, corresponding to the period of maximum prevalence of surgical thyroid pathologies.

Age and Sex

Recurrent laryngeal nerve palsy in our series exclusively affected the 40–60 year age group, with a mean of 50 years, and mainly affected women (75%). Thomusch et al. identified female sex as an independent risk factor for RLNP, with a relative risk multiplied by 1.4 [13]. Hermann et al. also observed a significantly higher incidence in women (5.6% vs 2.9%, p<0.001) [14]. This female vulnerability could be related to a more delicate anatomy or increased consumption of anti-inflammatory medications in the perioperative period. Regarding age, its role as a risk factor remains debated. While Thomusch et al. attribute minor clinical importance to it (RR 1.01), other studies such as those by Sevim et al. or Zambudio et al. found no significant association [15,16].

Surgeon Experience

Analysis of our results highlights the predominant role of surgeon experience in the occurrence of recurrent laryngeal nerve palsies. Indeed, 75% of palsies (6 out of 8 cases) occurred during procedures performed by resident physicians in training, compared to only 25% for experienced senior surgeons. This observation is consistent with data in the literature, although the subject remains debated. Sosa et al. demonstrated that surgeons performing more than 100 thyroidectomies per year had significantly lower complication rates [17]. Dralle et al. reported an RLNP rate of 0.72% for surgeons exposing more than 45 nerves at risk per year, compared to 1.06% for those with lower activity (p=0.003) [18]. However, some studies such as those by Thomusch et al. or Erbil et al. found no significant difference between procedures performed by supervised residents and those of experienced surgeons [14,19,20]. These data suggest that structured training and supervision enable comparable results to be achieved, highlighting the importance of rigorous mentoring for surgeons in training.

Table 2: Percentage of Recurrent Laryngeal Nerve Palsies According to Different Studies

Authors	Publication date	Study period	Number of patients	Thyroïdectomy	Transient recurrent laryngeal nerve palsy	Permanent recurrent laryngeal nerve palsy
Jatzko [42]	1994	84-91	21	Total	9,50%	4,80%
Thomusch [14]	2000		7266	Total Partial	2,10%	1,10%
CLCONESSA [43]	2000	1995-1997	155	Total	3,20%	0,60%
Bellatonne [40]	2002	__	204	Total Partial	0,50%	0,20%
Aytac [45]	2005	1998-2003	416	Total Partial	13,60% 12%	9% 4%
F ménégaux [5]	2005	1992-2003	8005	Total Partial	1,36%	0,50%
Chaudhary [7]	2007	2000-2005	310	Total Partial	7,60% 6,25%	3,84% 1,42%
Hazem et Zakaria [3]	2010	1990-2005	340	Total Partial	3,80%	0,29%
P.culvier [46]	2012	2006-2010	306	Total Partial	2,58%	96,00%
A.harkani [11]	2014	2002-2013	1340	Total Partial	1,49%	0,08%
Wafa Abid [47]	2014	2000-2011	800	Total Partial	9,60%	1,10%
Joliat et al [8]	2017	2005-2013	451	Total	12,63%	1,30%
Our study	__	1018	100	Total Partielle	8%	__

Laterality of Involvement

We observed a marked predominance of right-sided recurrent laryngeal nerve palsies, accounting for 75% of cases. This finding is consistent with anatomical and clinical data reported in the literature. Due to its more oblique course and its relationships with the subclavian artery, the right recurrent laryngeal nerve has particular anatomical vulnerability [27,28]. in a prospective study of 301 patients, reported right-sided involvement in 62% of cases compared to 28% on the left [19]. Thomusch et al. also confirmed this predisposition, linked to anatomical variations of the right nerve, particularly its relationships with the inferior thyroid artery where it is more frequently pre-arterial, thus more exposed during dissection [14-29]. No significant difference is reported in other series, however, such as that of Hayward et al. which found similar rates on the right and left [30].

Table 3: Percentage of Laterality of Involvement According to Selected Studies

Authors	Publication date	Unilateral recurrent laryngeal nerve palsy	Bilateral recurrent laryngeal nerve palsy
Cl Conessa [43]	2000	8,80%	0%
Bellanton [40]	2002	0,70%	0%
F Ménégaux [46]	2005	1,66%	0,20%
Efremidou [31]	2009	1,50%	0%
Duclos [32]	2012	2,08%	0%
A Harkani [47]	2014	0,15%	0,07%
Joliat [8]	2017	13%	0,88%
Our study	__	8%	0%

Nature of the Operated Pathology

In our series, 36% of patients who developed recurrent laryngeal nerve palsy were operated on for thyroid carcinoma, although this association did not reach statistical significance (p=0.65). The literature nevertheless reports an increased risk of nerve injury in cases of malignant pathology, related to dissection difficulties, tumor invasion, or the need for lymph node dissection [5,33,34]. Dralle et al. reported permanent palsy in 1.52% of patients operated on for cancer, compared to 0.5% for benign pathologies (p<0.001) [21]. Similarly, Lo et al. observed significantly higher rates of RLNP in oncological surgery (5.26%) compared to benign tumors (0.7%, p=0.01) [35,15,36]. The lack of significance in our study could be related to the modest size of our sample and the low proportion of patients who underwent extensive lymph node dissection.

Extent of Resection

All patients in our series who developed recurrent laryngeal nerve palsy had undergone total thyroidectomy. This finding raises the question of the risk associated with the extent of the surgical procedure. Thomusch et al. demonstrated that the risk of nerve injury was correlated with the radical nature of the resection, with a relative risk of 2.0 to 2.1 for total thyroidectomies compared to partial resections [14]. Erbil et al. reported a 12.6-fold higher risk of RLNP in cases of extensive surgery (lobectomy or total thyroidectomy) compared to subtotal resection (p=0.01) [15]. However, other authors such as Ayache et al. or Prim et al. found no significant difference according to the type of resection, suggesting that it is more the meticulous dissection than the extent of resection that determines nerve risk [22,37].

Clinical Implications and Prevention

The 8% prevalence of recurrent laryngeal nerve palsies in our series, half of which were asymptomatic, underscores the critical importance of systematic pre- and postoperative nasofibroscopy. This examination, recommended by many authors, allows not only the detection of subclinical injuries but also the establishment of medicolegal evidence in case of litigation [4,9,10]. The absence of systematic examination in many series very likely leads to an underestimation of the true incidence of recurrent laryngeal nerve palsies [5].

Visual identification of the recurrent laryngeal nerve, systematically practiced in our department, constitutes the gold standard for preventing nerve injuries [13,38,39]. Hermann et al., in a review of 16,443 patients, demonstrated that the incidence of temporary and permanent palsies was significantly reduced when the nerve was identified, with permanent injury rates of 0.9% for simple localization, 0.3% for partial dissection, and 0.1% for complete nerve dissection [30]. However, visual identification does not completely eliminate the risk of injury, as evidenced by palsies occurring on macroscopically intact nerves [40,41]. Snyder et al. reported that nerve transection was rare (0.45%), but dysfunction of an intact nerve was significantly more frequent (3.3%) [33].

Intraoperative neuromonitoring of the recurrent laryngeal nerve has developed as a complementary tool to visual identification. Although our study did not evaluate this technique, the literature reports contrasting results. While some studies show a reduction in transient palsies, the benefit for permanent palsies is not clearly demonstrated [20,42-44]. The meta-analysis by Higgins et al., involving 64,699 nerves at risk, found no significant difference in terms of transient palsies (2.74% with monitoring vs 2.49% without) or permanent palsies (0.75% vs 0.58%) [35]. However, monitoring seems particularly useful in high-risk surgeries (reoperations, invasive cancers, large goiters) and for predicting postoperative nerve function, with a high negative predictive value of 92 to 100% [45,46].

Study Limitations

Our work has certain limitations that should be mentioned. This is a single-center study with a modest sample size (100 patients), which limits the statistical power of our analyses and the generalizability of our results. The absence of long-term follow-up beyond 12 months did not allow us to formally distinguish transient from permanent palsies, the usual duration for defining permanent injury being 12 months [3,47]. Finally, the non-randomized nature of the study exposes it to potential selection biases, particularly regarding the distribution of procedures between senior surgeons and residents.

Perspectives

Despite these limitations, our study provides useful insight into the prevalence and risk factors of recurrent laryngeal nerve palsies in our context. It highlights the importance of structured surgical training and systematic identification of the recurrent laryngeal nerve. In the future, the widespread use of intraoperative neuromonitoring, particularly in complex cases, could help further reduce the incidence of this feared complication [48]. Larger prospective multicenter studies are needed to confirm these trends and evaluate the impact of different prevention strategies.

Conclusion

The 8% prevalence of recurrent laryngeal nerve palsies in our series, comparable to the highest data in the literature, confirms the need for increased vigilance during thyroid surgery. Surgeon experience, right-sided involvement, and extent of resection appear to be the main risk factors in our practice. Systematic identification of the recurrent laryngeal nerve and routine postoperative nasofibroscopy in all patients are essential components for preventing and detecting this complication. Improving the training of young surgeons and the use of intraoperative monitoring in complex cases could further reduce the incidence of this morbidity with its sometime severe functional consequences.

Declarations

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Ethics Approval and Consent to Participate

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Ethics Committee of 20 august hospital. Written informed consent was obtained from all participants.

Consent for Publication

Written informed consent for publication was obtained from the participants.

Competing Interests

The authors declare that they have no competing interests

References

1. Al Sobhi S (2002) The current pattern of thyroid surgery in Saudi Arabia and how to improve it. Ann Saudi Med 22: 256-257.
2. Gonçalves Filho J, Kowalski LP (2005) Surgical complications after thyroid surgery performed in a cancer hospital. Otolaryngol Head Neck Surg 132: 490-494.
3. Hazem M Zakaria, Naif A Al Awad, Ali S Al Kreedes, Abdul Mohsin A Al Mulhim, Mohammed A Al Sharway, et al. (2011) Recurrent laryngeal nerve injury in thyroid surgery. Oman Med J 26: 34-38.
4. Baujat B, Delbove H, Wagner I, Fugain C, de Corbière S, et al. (2001) Immobilité laryngée post-thyroïdectomie. Annales de Chirurgie 126: 104-110.
5. Tresallet C, Chigot JP, Menegaux F (2006) How to prevent recurrent nerve palsy during thyroid surgery?. Ann Chir 131: 149-153.
6. Rosato L, Avenia N, Bernante P, De Palma M, Gulino G, et al. (2004) Complications of thyroid surgery: analysis of a multicentric study on 14,934 patients operated on in Italy over 5 years. World J Surg 28: 271-276.
7. Chaudhary IA, Samullah MR, Masood R, Majrouh MA, Malhi AA (2007) Recurrent laryngeal nerve injury: an experience

with 310 thyroidectomies. J Ayub Med Coll Abbottabad 19: 49-50.
8. Bergamaschi R, Becouarn G, Ronceray J, Arnaud JP (1998) Morbidity of thyroid surgery. Am J Surg 176: 71-75.
9. Joliat GR, Guarnero V, Demartines N, Schweizer V, Matter M (2017) Recurrent laryngeal nerve injury after thyroid and parathyroid surgery : Incidence and postoperative evolution assessment. Medicine 96: e6674.
10. Liu Q, Djuricin G, Prinz RA (1998) Total thyroidectomy for benign thyroid disease. Surgery 123: 2-7.
11. Harkani A (2008) Recurrent Laryngeal Nerve Palsy Following Thyroid Surgery : A Report on an Experience of 1,340 Thyroidectomies. Int Surg 93: 257-260.
12. Thomusch O, Machens A, Sekulla C, Ukkat J, Lippert H, et al. (2000) Multivariate analysis of risk factors for postoperative complications in benign goiter surgery: Prospective multicenter study in Germany. World J Surg 24: 1335-1341.
13. Hermann M, Keminger K, Kober F, Nekahm (1991) Risk factors in recurrent nerve paralysis : a statistical analysis of 7566 cases of struma surgery. Chirurg 62: 182-187.
14. Zambudio AR, Rodríguez J, Riquelme J, Soria T, Canteras M, et al. (2004) Prospective Study of Postoperative Complications After Total Thyroidectomy for Multinodular Goiters by Surgeons With Experience in Endocrine Surgery. Ann Surg 240: 18-25.
15. Sevim T (2007) Risk factors for permanent laryngeal nerve paralysis in patients with thyroid carcinoma. Clin Otolaryngol 32: 378-383.
16. Sosa JA, Bowman HM, Tielsch JM, Powe NR, Gordon TA, et al. (1998) The Importance of surgeon experience for clinical and economic outcomes from thyroidectomy. Ann Surg 228: 320-330.
17. Dralle H, Sekulla C, Haerting J, Wolfgang Timmermann, Hans Jürgen Neumann, et al. (2004) Risk factors of paralysis and functional outcome after recurrent laryngeal nerve monitoring in thyroid surgery. Surgery 136: 1310-1322.
18. Erbil Y, Barbaros U, Issever H, I Borucu, A Salmaslioğlu, et al. (2007) Predictive factors for recurrent laryngeal nerve palsy and hypoparathyroidism after thyroid surgery. Clin. Otolaryngol 32: 32-37.
19. Makay O, Icoz G, Yilmaz M, Akyildiz M, Yetkin E (2008) The recurrent laryngeal nerve and the inferior thyroid artery--anatomical variations during surgery. Langenbecks Arch Surg 393: 681-685.
20. Jatzko GR, Lisborg PH, Muller MG, Wette VM (1994) Recurrent nerve paralysis after thyroid operations: principal nerve identification and a literature review. Surgery 115: 139-144.
21. Conessa CL, Sissokko B, Faye M (2000) Les complications de la chirurgie thyroïdienne à l'hôpital principal de Dakar. À propos de 155 interventions. Med Afrique Noire 47: 157-160.
22. Page C, Zaatar R, Biet A, Strunski V (2007) Subjective voice assessment after thyroid surgery : a prospective study of 395 patients. Indian J Med Sci 61: 448-454.
23. Aytac B, Karamercan A (2005) Recurrent laryngeal nerve injury and preservation in thyroidectomy. Saudi Med J 26: 1746-1449.
24. Strunski V, Page C, Cuvelier P, Boute P, Biet A (2012) Intérêt de la neurostimulation du NLI dans la chirurgie thyroïdienne. Annales françaises d'Oto-rhino-laryngologie et de Pathologie Cervico-faciale 129: A39-A40.
25. Abid W, Ben Gamra O, Nacef I, El Euch W, Belhaj Younes F, et al. (2014) Complications postopératoires dans la chirurgie thyroïdienne. Annales d'Endocrinologie 75: 321.
26. Campos BA, Henriques PR (2000) Relationship between the recurrent laryngeal nerve and the inferior thyroid artery: a study in corpses. Rev Hosp Clin Fac Med Sao Paulo 55: 195-200.
27. Laccourreye O, Cauchois R, Touraine ph Garay A, Bourla A (2005) Preoperative oral information prior to planned thyroid surgery: the surgeon, physician, lawyer and judge's point of view. Annales de Chirurgie 130: 458-465.
28. Thomusch O, Sekulla C, Walls G, Machens A, Dralle H (2002) Intraoperative neuromonitoring of surgery for benign goiter. Am J Surg 183: 673-678.
29. Hayward NJ, Grodski S, Yeung M, Johnson WR, Serpell J (2013) Recurrent laryngeal nerve injury in thyroid surgery: a review. ANZ J Surg 83: 15-21.
30. Efremidou EI, Papageorgiou MS, Liratzopoulos N, Manolas KJ (2009) The efficacy and safety of total thyroidectomy in the management of benign thyroid disease : a review of 932 cases. Can J Surg 52: 39-44.
31. Duclos A, Peix JL, Colin C, Jean LK, Febrice M, et al. (2012) Influence of individual surgeons in thyroid surgery: prospective cross-sectional multicentre study. BMJ 10.
32. Ayache S, Tramier B, Chatelain D, Mardyla N, Benhaim T, et al. (2005) Évolution de la chirurgie thyroïdienne vers la thyroïdectomie totale. Ann Otolaryngol Chir Cervicofac 122: 127-133.
33. Chiang FY, Wang LF, Huang YF, Lee KW, Kuo WR (2005) Recurrent laryngeal nerve palsy after thyroidectomy with routine identification of the recurrent laryngeal nerve. Surgery 137: 342-347.
34. Lo CY, Kwok KF, Yuen PW (2000) A prospective evaluation of recurrent laryngeal nerve paralysis during thyroidectomy. Arch Surg 135: 204-207.
35. Chan WF, Lo CY (2006) Pitfalls of intraoperative neuromonitoring for predicting postoperative recurrent laryngeal nerve function during thyroidectomy. World J Surg 30: 806-812.
36. Prim MP, de Diego JI, Hardisson D, Madero R, Gavilan J (2001) Factors related to nerve injury and hypocalcemia in thyroid gland surgery. Otolaryngol Head Neck Surg 124: 111-114.
37. Hermann M, Alk G, Roka R (2002) Laryngeal recurrent nerve injury in surgery for benign thyroid disease: effect of the nerve dissection and impact of individual surgeon in more than 27,000 nerves at risk. Ann Surg 235: 261-268.
38. Hermann M (2003) Main topics: neuromonitoring in thyroid surgery---who benefits?. Eur Surg 35: 225-226.
39. Karamanakos SN, Markou KB, Panagopoulos K (2010) Complications and risk factors related to the extent of surgery in thyroidectomy. Results from 2043 procedures. Hormones 9: 318-325.
40. Snyder SK, Lairmore TC, Hendricks JC, Roberts JW (2008) Elucidating Mechanisms of Recurrent Laryngeal Nerve Injury During Thyroidectomy and Parathyroidectomy. Journal of the American College of Surgeons 206: 123-130.
41. Higgins TS, Gupta R, Ketcham AS, Sataloff RT, Wadsworth JT, et al. (2011) Recurrent laryngeal nerve monitoring versus identification alone on post-thyroidectomy true vocal fold palsy: a meta-analysis. Laryngoscope 121: 1009-1017.
42. Robertson ML, Steward DL, Gluckman JL (2004) Continuous laryngeal nerve integrity monitoring during thyroidectomy: does it reduce risk of injury? Otolaryngol Head Neck Surg 131: 596-600.
43. Randolph GW, Dralle H, Abdullah H (2011) Electrophysiologic recurrent laryngeal nerve monitoring during thyroid and

parathyroid surgery. International standards guideline statement. Laryngoscope 121: 1-16.

44. Chiang FY, Lee KW, Chen HC (2010) Standardization of intraoperative neuromonitoring of recurrent laryngeal nerve in thyroid operation. World J Surg. 34: 223-229.
45. Thomusch O, Sekulla C, Machens A, Neumann HJ, Timmermann W, et al. (2004) Validity of intra-operative neuromonitoring signals in thyroid surgery. Langenbecks Arch Surg 389: 499-503.
46. Page C, Charlet L, Michel L, Ayache S, Strunski V (2004) The Non-Recurrent Inferior Laryngeal Nerve: Two Case Reports. Morphology 88: 72.
47. Bellantone R, Lombardi CP, Bossola M, et al. (2002) Total thyroidectomy for management of benign thyroid disease: review of 526 cases. World J Surg 26: 1468-1471.
48. Dralle H, Sekulla C, Lorenz K (2008) Intraoperative monitoring of the recurrent laryngeal nerve and thyroid surgery. World J Surg 32: 1358-1366.