Abstract

Objective: The aim of this study is to evaluate the risk of recurrent laryngeal nerve palsy (RLNP) after thyroid surgery with routine identification of the recurrent laryngeal nerve (RLN) intra operatively.

Patients and Methods: Our study involved 379 patients who underwent 151 Near Total Thyroidectomy, 107 Sub Total Thyroidectomy, 82 total lobectomies and 39 total thyroidectomies, treated by three surgeons. Individually temporary and permanent RLNP rates were analyzed for patient groups which more classified into primary operation for benign thyroid disease, Thyroid cancer, Graves disease, and reoperation. Two RLNs in 12 thyroid cancer patients already invaded were excluded from analysis.

Results: Three patients developed RLNP postoperatively. Complete recovery of RLN function was documented for all (100%) of these cases whose RLN integrity had been ensured intraoperatively. Recovery from temporary RLNP was insured within 4 weeks to 3 months (mean 2 months). Overall rate of temporary and permanent RLNP was 0.795% and 0.00%, respectively. The rates of temporary RLNP were 10%, 5.26%, 1.2% and 0.0% for groups classified according to thyroid cancer, reoperation, Graves' disease and benign thyroid disease, respectively.

Conclusions: Thyroidectomy is a routine and safe surgical procedure with a low morbidity and negligible mortality when performed by trained surgeons and most of the complications of thyroidectomy may be avoided by careful surgical technique.

Significantly higher RLNP rates were demonstrated after operations for thyroid cancer, recurrent goiter and Graves' disease. Total lobectomy with routine identification of the RLN is quite safe and we suggest considering it as a basic procedure in a thyroid operation.

الخلاصة

الهدف من هذه الدراسة هو تقييم المخاطر من شلل العصب الحنجري المتكرر (RLNP) بعد جراحة الغدة الدرقية مع التحديد الروتيني للعصب (RLN) داخل العملية.

وقد شملت الدراسة 379 مريضا أجرتهم عمليات استئصال الغدة الدرقية عن طريق ثلاثة جراحين. وقد سجلت المرضى إلى أربعة مجموعات وهي المجموعة الأولى ومرضى الغدة الدرقية الحديدة، وسرطان الغدة الدرقية، مرض الكبد والغدة الراجعة. وقد تم تحليل الإصابة بشلل العصب الحنجري الراجع بالنسبة للتصنيف أعلاه.
Introduction

Vocal fold paresis or paralysis may have a devastating impact on the patient's life, especially in an unanticipated situation. Furthermore, hoarseness is likely to become a more disabling condition as voice recognition becomes an important element of technology and replaces manual information entry such as typing and keyboarding.[1]

Recurrent laryngeal nerve paralysis may be unilateral or bilateral, transient or permanent. Transient paralysis occurs, in 3% of nerves at risk and recovers in 3 weeks to 3 months. [2] The reported incidence of permanent nerve palsy varies widely from 0% to 5.8% of patients and regarded as permanent if it persisted for more than 1 year after the operation. [3, 4]

The variability of The Inferior Thyroid Artery (ITA) and its position relative to the RLN makes it a poor surgical landmark; however ligation of the artery should not be performed until the RLN has been correctly identified. [2,5]

RLN also may divide into several branches before entering the larynx where the inferior corns of the thyroid cartilage is a fairly constant landmark for its point of entry.[6]Non-recurrent RLNs are rare; however, an awareness of their existence and correct surgical technique will prevent the surgeon from iatrogenic trauma if one is encountered. [2,5] Neural disruption may be mediated by iatrogenic means; thermal damage, sharp dissection, ischaemia, stretching, retraction, compression, endocrine alteration at the time of operating, and neoplastic mediated pressure on the laryngeal nerves or strap muscles inducing paresis or paralysis of the vocal folds.[7,8]

Traditional technique advocates identification of the mid to inferior segment, close to the inferior thyroid artery; however, many surgeons search for the distal segment just below Berry's ligament. This has the advantage of preventing disruption to the blood supply to the inferior parathyroid gland. [9]

RLN damage is a well-recognized morbidity after thyroidectomy and has been involved in most claims concerning complications of thyroid surgery. [10] Total thyroidectomy can lead to complications that are not seen after lobectomy, Including hypothyroidism, hypoparathyroidism, and recurrent laryngeal nerve palsy. [11] The risk of injury is increased in cases of malignancy, secondary operation, re exploration for hemorrhage, anatomic variability, anatomic distortion from goiter or neoplasm, and primary failure to
identify the recurrent nerve. [12] That makes surgical technique is one of the important factors affecting the outcome of thyroidectomy.[13] so nerve injury may be avoided with accurate anatomic localization during surgical dissection.

**Patients and Methods**

From January 1st, 2006 to April, 2009, 379 consecutive patients underwent thyroidectomy for treatment of various thyroid diseases by a three surgeons. Two patients with preoperative unilateral cord paralysis secondary to malignant involvement of recurrent nerve was excluded from the analysis. There were 51 males and 328 females. In the study (age range, 13-75 years; median age, 41 years). Routine identification of the recurrent laryngeal nerve was performed during all operative procedures.

Indirect or in difficult cases flexible laryngoscopy were performed before operation.

Suspected nerve damage was documented during the operation and the recurrent laryngeal nerve is identified in its course first below the level of the inferior thyroid artery as it passes obliquely upwards and forwards. This oblique course to the trachea and esophagus is accentuated by mobilization of the thyroid lobe. If not immediately seen, the nerve can usually be palpated as a taut strand. At a higher level, the nerve lies between the branches of the inferior thyroid artery. The nerve passes into the larynx under the inferior border of the inferior constrictor immediately behind the inferior corns of the thyroid cartilage.

Postoperative cord palsy was defined as the presence of an immobile vocal cord or the decreased movement of the vocal cord during phonation. Patients with recurrent nerve palsy were followed up by an otorhinolaryngologist with a periodic vocal cord examination until full recovery was documented. Postoperative transient and permanent cord palsy was calculated in relation to the number of patients.

Potential risk factors for recurrent nerve paralysis, including the underlying pathological characteristics which divided in to four groups

1- Primary benign diseases (which include non toxic multinodular goiter, toxic multinodular goiter, thyroiditis, and adenomas)

2- Thyroid operations for Graves' disease.

3- Thyroid reoperations.

4- Thyroid cancer.

Comparisons were based on the number of patients developing cord palsy rather than on the number of nerves at risk.

**Results**

The operative procedure included total thyroidectomy in 39 patients, unilateral lobectomy in 82 patients, bilateral subtotal thyroidectomy in 107 patients and near total thyroidectomy in 151 patients .Routine identification of the recurrent laryngeal nerve was performed during all operative procedures. Primary benign diseases (which include non toxic multinodular goiter, toxic multinodular goiter, thyroiditis, and adenomas) were performed in (266 cases 70.18 %). Thyroid operations for Graves' disease were performed in 82 cases (21.6 %), Thyroid reoperations were performed in 19 (5.01 %) of the patients and thyroid cancer operations were performed in 12 (3.16 %) patients.
Patients who underwent a primary operation for benign thyroid conditions had neither transient nor permanent palsy, while Patients who underwent an operation for thyroid cancer had a higher incidence for RLNP followed by operations for recurrent goiter and then operations for Graves' disease.

Postoperative unilateral cord palsy was documented in three patients (0.79%) during vocal cord examination, and voice disturbance. During a median period of 2 months (range, 1-3 months), all patients (100%) had recovery of vocal cord function proved by otorhinolaryngologist periodical examinations with preceding improvement in phonation. The rate of transient RLNP was 0.79% while No permanent RLNP was reported in our study.

The rate of nerve palsy with respect to the number of patients and according to the underlying pathological characteristics and types of thyroidectomy are shown in the table (1).

Discussion

In the past, most surgeons avoided dissections in close proximity to the RLN to prevent its injury; recently, surgeons consider this totally unacceptable.

There are many studies demonstrating a significant decrease in the rate of RLN injury maintained by the identification of the nerve [13, 14, 15]

Meticulous hemostasis and delicate technique are required to prevent nerve injury. [16]

To avoid damage to the recurrent laryngeal nerve (RLN) a detailed knowledge of the variable anatomy of its course is required and identification is fundamental to avoid trauma and the adjacent junction between the inferior thyroid artery and recurrent laryngeal nerve should be carefully identified by gentle dissection of the overlying fascial layers with a small artery clip and is recognized as a white cord with an overlying vasanervosum usually coursing latero-medially deep to the inferior thyroid artery.

The nerve is perhaps most in danger at its point of entry into the larynx as it passes through the suspensory ligament of Berry, where it often adopts a curving loop and the nerve must be carefully identified in this region before dividing the suspensory fascia by staying close to the thyroid capsule at all times.[2] Once found, the nerve with all the identified branches must be followed superiorly through the entire course, until it enters the larynx. [17]

Postoperative morbidity was found to be increased with the increasing extent of thyroid resection, underlying thyroid disease, recurrent operation, intraoperative technique, surgeon’s experience [13, 18, 19] and the addition of neck dissection were the risk factors for postoperative thyroid morbidity. [20]

In our study the incidence of permanent RLNP in thyroid cancer is 9.3% and nil in secondary thyroidectomy. Graves' disease and Primary benign thyroid diseases, however, the incidence of permanent recurrent nerve paralysis could be as high as 13% and 30% of patients during thyroid cancer operations and secondary thyroidectomy, respectively. [21]

Surgery for recurrent goiter was done for 19 patients in our study; this reflects the numbers of subtotal procedures previously performed and as might be expected, stretching or inadvertent transection of the RLN
occurs more frequently when the nerve must be dissected from distorted and/or scarred tissue, so that the extent of resection also regarded as Potential risk factors for RLNP in the secondary operation. These emphasize the necessity for total lobectomy with routine identification of the RLN in any initial thyroid operation so that thyroidectomy can be completed after unilateral total lobectomy with little risk of nerve injury.

Bilateral palsy is exceedingly rare, but may lead to temporary or permanent tracheostomy. This is most likely to be a problem where re-operation is performed when one recurrent laryngeal nerve has already been permanently damaged. The frequency of the RLN injury following thyroid surgery should be below 1% although this will clearly reflect case-mix and operative experience. [2]

In our study, Preoperative vocal cord palsy was noted at the side of the previous lobectomy in 1 patient who underwent completion total thyroidectomy and passed smoothly without transient or permanent RLNP.

Near-total thyroidectomy achieves a lower complication rate of hypoparathyroidism and a similar complication rate of RLNP and recurrence when compared with the rates reported in the literature for total thyroidectomy. It is an effective and safe surgical treatment option for various benign thyroid diseases [22], so that in our study Near-total thyroidectomy was performed in 151 (39.8%) cases and consisted of total lobectomy in the lobe having the dominant nodule, with isthmectomy and near-total lobectomy in the contra lateral side, leaving a small quantity of about 2 g of thyroid tissue adjacent to the parathyroid glands and their blood supply.

In our study, Operation for Graves disease was associated with a rate of 1.2% of transient RLNP because stretching occurs more frequently during dissection of the nerve and also because the hypervascularity of the thyroid gland in Graves' disease. Even in the hands of surgeons experienced in endocrine surgery, operation for Graves' disease was reported as an independent risk factor for developing RLN injury after total thyroidectomy. [23]

The identification, careful exposure and preservation of the RLN throughout its course, proper intraoperative technique, and surgeon’s experience are important to prevent nerve injury. [13, 17, 18]

**Conclusion**

Thyroidectomy is a routine and safe surgical procedure with a low morbidity and negligible mortality when performed by trained surgeons and most of the complications of thyroidectomy may be avoided by careful surgical technique.

Significantly higher RLNP rates were demonstrated after operations for thyroid cancer, recurrent goiter and Graves' disease. Total lobectomy with routine identification of the RLN is quite safe and we suggest considering it as a basic procedure in a thyroid operation.

Stretching and hypervascularity of the thyroid gland in Graves disease regarded as a risk factor for developing RLN injury after total thyroidectomy, therefore, we suggest that total thyroidectomy for Graves’ disease should be also performed by an experienced surgeon.
Table 1 Rate of RLNP according to the underlying diseases

<table>
<thead>
<tr>
<th>Underlying diseases</th>
<th>Thyroid</th>
<th>No. of patients</th>
<th>No. of TT</th>
<th>No. of NTT</th>
<th>No. of STT</th>
<th>No. of TL</th>
<th>Transient RLNP</th>
<th>Permanent RLNP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary benign diseases</td>
<td>266</td>
<td>15</td>
<td>82</td>
<td>96</td>
<td>73</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graves' diseases</td>
<td>82</td>
<td>10</td>
<td>61</td>
<td>11</td>
<td></td>
<td>1</td>
<td>1 (1.2 %)</td>
<td></td>
</tr>
<tr>
<td>Recurrent goiter</td>
<td>19</td>
<td>4</td>
<td>6</td>
<td>9</td>
<td></td>
<td>1</td>
<td>(5.26%)</td>
<td></td>
</tr>
<tr>
<td>Thyroid cancers</td>
<td>12*</td>
<td>10</td>
<td>2</td>
<td></td>
<td></td>
<td>1</td>
<td>(10%)</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>379</td>
<td>39</td>
<td>151</td>
<td>107</td>
<td>82</td>
<td>3</td>
<td>(0.795%)</td>
<td>0.0%</td>
</tr>
</tbody>
</table>

Total Thyroidectomy (TT); Subtotal Thyroidectomy (STT); Near Total Thyroidectomy (NTT); Total Lobectomy (TL).

*Note: two patients with preoperative unilateral cord paralysis secondary to malignant involvement of recurrent nerve was excluded from the analysis

References


22. Zeki Acun, Mustafa Comert, Alper Cihan, Suat Can Ulukent, Bulent Ucan,