The aim of the study was to assess the frequency of non-recurrent laryngeal nerves (Non-RLN).

Material and methods. A total of 6110 patients were operated in our hospital between 1 January 2005 and 31 December 2013 for various goiters (5429) and various types of hyperparathyroidism (618). Laryngeal nerve was exposed during operation in 1700 patients from superior aperture of the chest to superior aperture of the larynx. Identification process of RLN was started with dissecting inferior thyroid artery (ITA) and its junction with the nerve. Then main trunk of the nerve was exposed backwards till the region of superior aperture of the chest together with the end portion till the nerve outlet to the larynx.

Results. In the group of 1700 patients, RLN was exposed bilaterally in 1400 (82.4%) and unilaterally in 300 (17.6%). In the group of 3100 dissected RLNs the course of RLN was observed on the right side in 1710 patients and on the left in 1390. Irreversible nature RLN was shown in four cases (0.1%) – four women (02%) aged 42-55 (mean 49.3) – three operated for non-toxic nodular goiter and one for primary hyperparathyroidism. Each time the Non-RLN was seen on the right side. The other patients manifested recurrent character RLN. Moreover, interstitial course of RLN was found on the left side in one man.

Conclusion. Non recurrent laryngeal nerve is a rare anatomical variation, occurring more frequently on the right side. Surgeon during surgery of the thyroid and parathyroid glands should be aware of its existence to avoid damage.

Key words: nodular goiter, recurrent laryngeal nerve

History of medicine, including experiences of Leonides or Claudius Gallen at the beginning of A.D., indicates that the first surgical attempts within head or neck often involved a complete loss of voice. Consequently, an attention was paid to a voice nerve. The development of anatomy and surgery, both related closely together, showed that such complications occurred chiefly during operations on thyroid glands and they had a connection with injuries to recurrent laryngeal nerves (RLN).

Frequency of injuries to RLN may be related to the goiter size, type and also the extent of operative procedures (1-5). Experience of the surgeon, knowledge about anatomical conditions within the neck and possible discrepancy in anatomical course of recurrent laryngeal nerves are also important (6, 7, 8).

The purpose of the study was to assess the frequency of non-recurrent laryngeal nerves.

MATERIAL AND METHODS

Between 1 January 2005 and 31 December 2013 a total of 6110 patients were operated for various goiters (5492) and various types of hyperparathyroidism (618). Each patient received ultrasonography of the neck and X-ray of the chest. All patients underwent laryngological examination and assessment of thyroid hormonal function prior to operation.

The operation revealed recurrent laryngeal nerve from the region of superior aperture of the chest to superior aperture of the larynx in 1700 patients. The first step to identify RLN
was dissecting inferior thyroid artery (ITA) and its junction with the nerve. Then main trunk of the nerve was exposed backwards till the region of superior aperture of the chest together with the end portion till the nerve outlet to the larynx. Isolating the junction of RLN and ITA was also one of the key operative steps in patients with hyperparathyroidism used to identify parathyroid glands.

RESULTS

Among 1700 patients, RLN was exposed bilaterally in 1400 (82.4%) and unilaterally in 300 (17.6%). In the group of 3100 dissected RLNs the course of RLN was observed on the right side in 1710 patients and on the left in 1390. Irreversible nature was shown in four cases (0.1%) – four women (0.2%) aged 42-55 (mean 49.3) – three operated for non-toxic nodular goiter and one for primary hyperparathyroidism. Each time the Non-RLN was seen on the right side. It began at the chief trunk of the vagus nerve in the neck region at nearly right angle and went perpendicularly to the larynx toward its outlet (fig.1). No other developmental anomalies were observed in these patients. The other patients manifested recurrent character of RLN. Moreover, interstitial course of RLN was found on the left side in one man. It penetrated into the thyroid parenchyma around the left inferior pole.

DISCUSSION

Recurrent laryngeal nerve, being a branch of the vagus nerve, begins within the mediastinum. It goes backwards toward the neck, bilaterally in the vicinity of thyroid inferior pole and posterior surface within tracheoesophageal groove to cross with the inferior thyroid artery (9). Its main trunk consists of anterior and posterior small branches. The first of them innervates a group of laryngeal adductors namely lateral cricoarytenoid muscle, thyroarytenoid muscle, thyroepiglottic muscle and aryepiglottic muscle, while posterior small branch innervates a group of antagonists namely adductor-posterior cricoarytenoid muscle and transverse oblique arytenoid muscle. End-piece of the branch, in the form of an inferior laryngeal nerve, penetrates into inferior horn of the thyroid cartilage. Apart from motor fibers innervating laryngeal muscles and responsible for mobility of vocal folds and phonation, RLN also contains sensory fibers that innervate mucous membrane around subglottic larynx.

There are many topographic variations, described in the literature, as to the junction of RLN and inferior thyroid artery or RLN’s end before its penetration into the larynx (9, 10).

Proportion of RLN to ITA is varying. However, as shown by personal studies and other authors’ experience, it usually goes backward from the artery (9, 11). Mutual topography of RLN and ITA is critical because just below the junction of these anatomical structures dissecting of the nerve should begin. Exposure of RLN should precede the dissecting process of inferior thyroid artery (9, 10).

Non-RLN is a rare condition. The frequency of its occurrence is estimated to reach 0.3-1.6% on the right side and merely 0.04% on the left (7, 12, 13, 14). Observations of other authors confirm our personal experience both within frequency of its occurrence and more frequent prevalence on the right side. It is usually accompanied by other developmental

Fig. 1.
anomalies, in the first place by abnormal deviation of the right subclavian artery or situs inversus phenomenon (7).

Preoperative diagnosis of Non-RLN is practically not possible, and it can only be suspected on the basis of other developmental anomalies (12). As there are concomitant vascular anomalies, it can chiefly be based on x-ray examinations like computed tomography or angiography (12, 15). Non-RLN can also be confirmed preoperatively by USG (16).

Knowledge of the fact that there are anatomical variations of RLN course is particularly important for a surgeon operating on the neck, thyroid gland or parathyroid glands (2, 7, 17, 18). As early as in 1938 Lahey stressed the importance of routine dissecting RLN during goiter operations. Basing on the literature data, there is a uniformity of opinions as to the method of preventing accidental injuries to RLN (3, 9, 19). It is important to know very well the anatomy, to be aware of RLN variations and to use an appropriate operative technique, the latter consisting of delicate exposure of thyroid lobes making the incision high on the thyroid capsule with wedge resection of the parenchyma, in case of partial excision, and RLN identification along its entire course.

Intraoperative identification of RLN may have preventive or diagnostic character (1). The purpose of the former management is to protect RLN against injuries if a dangerous situation arises in connection with a preoperative diagnosis or size of the goiter or preoperative paralysis of vocal folds. Diagnostic exposure of RLN, performed if an injury has been suspected, may result in an attempt to restore continuity of the nerve after it was cut or to release the ligature if accidentally ligated. Reconstruction of the nerve continuity will probably restore its function (1, 2).

Such management helps to restrict the frequency of severe complications arising from unilateral or even bilateral injuries to RLN. The latter lead to acute respiratory failure during early postoperative period. Its symptoms appear immediately after the intubation tube has been removed while vocal folds impair the patency of respiratory tract as they take an adducted position. The patient suffocates showing increasing symptoms of peripheral and central cyanosis. In such situation a life-saving procedure consists of quick reintubation or tracheostomy.

An injury to RLN in thyroid and parathyroid surgery, as one of possible intra-operative complications, occurs rather rarely. Its frequency ranges between 0.5-3.5% (1, 3, 4). Each subsequent surgery within the neck, connected either with recurrence of the goiter or with unsuccessful operative treatment of hyperparathyroidism, may result in an increased risk of such injury.

Complications of this type occur usually after operative treatment for recurrent goiter or radical surgery for tumor goiter upon partial thyroid resection (1, 3).

Therefore it is very important to expose RLN during operation and also to realize that there may be anatomical variations (8). As shown by other authors, a large part of injuries to RLN, particularly in patients operated for recurrent goiters, can be to a great degree restricted through neuromonitoring (2, 11, 18).

CONCLUSION

Non-recurrent laryngeal nerve is a rare anatomical variation, occurring more frequently on the right side. Surgeon during surgery of the thyroid and parathyroid glands should be aware of its existence to avoid damage.

REFERENCES


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