RELATIONSHIP BETWEEN RECURRENT LARYNGEAL NERVE (RLN) AND INFERIOR THYROID ARTERY (ITA) IN OUR POPULATION

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ABSTRACT

Objective: To find out the relationship between recurrent laryngeal nerve(s) (RLN) and inferior thyroid artery (ITA) in patients undergoing thyroid surgery in our population.

Study Design: Descriptive, cross-sectional study.

Place and Duration of Study: Pak Emirates Military Hospital Rawalpindi and Combined Military Hospital Rawalpindi from Aug 2008 to Dec 2014.

Material; and Methods: One hundred recurrent laryngeal nerves, 50 right and 50 left were studied in 64 patients. All cases of benign goiter, malignant T1, T2 goiter, completion thyroidectomy cases on virgin side were included. Malignant T3, T4 cases, redo surgery, and large multi nodular goiter, cases in which posterior nodules have displaced the nerve (s) were excluded from the study. The course of the nerve was dissected in the thyroid vicinity and its relation with the inferior thyroid artery was recorded and photographed. All the data and special points were noted by the surgeons themselves in a register in all the cases and photographs were also taken. The data was entered and analyzed using statistical package for social sciences (SPSS) version 16. A *p*-value of <0.05 was considered significant.

Results: Hundred RLN were studied in 64 patients. In 36 patient RLN on both sides and in 14 patients the right and in 14 patients the left RLN were studied. The age ranged from 15-65 years with mean age 36.4 years. Male to female ratio was, 1: 4.3. Percentage of male patients was 18.75% as compared to female was 81.25%. In our study the nerve was more commonly found passing posterior to inferior thyroid artery on both sides and in both sexes. On the right side it was seen in 60% of cases and on the left side it was seen in 70% of the cases

Conclusion: Relationship of RLN with ITA is variable in our population. The surgeon should be aware of these variations and meticulous dissection of RLN is mandatory in tumor surgery and redoes thyroid surgery to avoid injury to these nerves.

Keywords: Inferior thyroid artery, Recurrent laryngeal nerve, Thyroid surgery.

INTRODUCTION

Thyroidectomy is one of the most frequently performed operations in iodine deficient areas and injury to recurrent laryngeal nerve(s) remains the most serious concern during this surgery especially in malignant cases and redo surgeries. Unilateral damage to recurrent laryngeal nerve (RLN) leaves the patient with a hoarse voice. Situation is disastrous if recurrent laryngeal nerve is damaged on both sides. This leads to bilateral abductor paralysis of the cord and may end up in a lifelong tracheostomy[1]. Permanent damage to RLN may occur in 0-2.1% and temporary palsy varies from 2.9% to over 10%[2] cases after thyroid surgery. This complication can be minimized by detailed anatomical knowledge of variations of RLN and meticulous surgical technique. The nerve has got a definite but varying relationship with inferior thyroid artey (ITA). The ITA can be easily identified during operation and serves as an important land mark for identification of RLN. The variations in the relation between the RLN and ITA during thyroidectomy and their courses have been widely studied with marked and contradictory relationships among different races[3-5]. The course also varies on the two sides of the neck in the same patient[6]. Not only the course is variable, there are number of extra laryngeal branches of RLN which are given off before crossing the inferior thyroid artery and these

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can be damaged if one is not aware of[7]. Failure to recognize these variations and branches invariably leads to RLN damage. The rationale of the study was to highlight various anatomical relationships between RLN and ITA in our patients undergoing thyroid surgery.

MATERIAL AND METHODS

This is a descriptive cross sectional study carried out at Pak Emirates Military Hospital and Combined Military Hospital Rawalpindi from Aug 2008 and Dec 2014. Sample size was calculated randomly. All the patients which met the inclusion criteria were added in the study. No specific calculator was used. A total of 100 RLN, 50 on right and 50 on left side were studied in total of 64 patients. Fifty two patients were female and 12 male patients were selected. Cases of all age groups and both sexes were selected. All cases of benign nodular goiter, malignant T1, T2 thyroid tumors and completion thyroidectomy cases on virgin side were included in our study. Malignant T3, T4 cases, redo surgery on same side, and large multinodular goiter cases in which posterior nodules have displaced the nerve (s) were excluded from the study. In 36 cases bilateral RLN in the same patient and in 14 cases right RLN and in 14 cases left RLN was studied. Formal consent of patient and permission of ethical committee of the institution was taken. Total thyroidectomy was performed in 12 cases (24 nerves). Dunhil/ bilateral subtotal thyroidectomy was performed in 24 cases (48 nervers, 24 nerves on each side), in 28 cases lobectomy and isthmectomy was performed (14 on the right and 14 on th left side). The thyoidectomy was performed through standard collar incision. The ITA was identified by visible pulsations, palpation or little bit dissection. The nerve was identified by careful dissection across the artery and was traced distally up to its entry in to larynx and its relation with the ITA was recorded and photographed. The position of RLN was classified in accordance with its position, anterior, posterior or in between the branches of ITA. The relationship of RLN with ITA was noted in all the patients separately, on each side, and in both sexes. Any anomaly in the course of both the ITA and RLN was also noted. The data was analyzed using SPSS version 16 and a *p*-value <0.05 was considered significant.

Table-I: Relation of Recurrent Laryngeal Nerve with Inferior Thyroid Artery on two sides N= 100

Nerve position	Right nerve No. (% age) n=50	Left nerve No. (% age) n=50
Post to artery	30 (60%) (10% behind branches, 50% behind trunk)	35 (70%) (12% behind branches, 58% behind trunk
Ant to artery	15 (30%) (4% in front of branches, 26% anterior to trunk)	13 (26%) (4% in front of branches, 22% anterior to trunk)
Between branches of ITA	3 (6%)	2 (4%)
Encirclage (Female)	1 (2%)	-
Non recurrent ((Male)	1 (2%)	-

Table-II: Relation of Recurrent Laryngeal Nerve with Inferior Thyroid Artery considering two sides together for N = 100.

Posterior to artery	65%
Anterior to artery	28%
Between the branches	5%
Total	98%*

*In 2 (2 %) cases the nerve did not have any of the above relation

RESULTS

A total of hundred nerves were studied in 64 patients. The age of the patients ranged from 15- 65 years with mean age 36.4years. Male to female ratio of, 1:4.3. The percentage of male

patients was 18.75% as compared to female patients was 81.25%. The relation of RLN with ITA is shown in table-I. The nerve was more commonly found passing posterior to the artery on both sides. In 60% cases on the right side RLN was passing posterior to ITA, 10% cases the nerve passed behind the branches of ITA and in 50% cases passed behind the trunk of ITA - on left side in 70% cases RLN was found passing posterior to ITA and of this 70% on left side 12% passed behind the branches and 58% passed behind the trunk. The RLN was found passing anterior to ITA (branches and trunk) in 30% cases on right side and 26% cases on left side. The nerve passed in between the branches of ITA in 6% cases on right side and 4% cases on left side. In 2% cases the nerve was seen encircling the ITA on right side and was non recurrent on right side in 2% cases. Considering the two sides together the RLN most commonly passed behind the inferior thyroid artery followed by anterior and between the branches as shown in table-II. There was no statistically significant difference in the relation between the RLN and ITA between the two sides. The relation of RLN with ITA in males and females was also not statistically significant as shown in table-III.

DISCUSSION

The injuries to RLN can result from various surgical procedures. It occurs more commonly during thyroid surgery[8]. The incidence of RLN injury during thyroid surgeries varies from 0 to 12%[9-13]. It is less with experienced surgeon and more with less experienced surgeon. Similarly operation for thyroid carcinoma, recurrent goitre and total thyroidectomy is associated with significantly increased risk of injury[10]. The only way to protect this nerve is careful dissection of nerve in thyroid vicinity. The ITA serves as an important landmark for identification of RLN[14]. Some surgeons use intra operative nerve monitoring to locate RLN but visualization with reference to inferior thyroid artery is superior in routine cases[15] but in recurrent cases intra operative monitoring is better[16]. The ITA which can be easily identified by palpation or even on inspection (visible artery or pulses) functions as a reference point for identification of RLN[17,18]. Although ITA functions as a reference point for identification of RLN but it has got varying

Table-III: Relation of Recrrent Laryngeal Nerve with Inferior Thyroid Artery in males and females considering two sides together.

Gender	Post to ITA No.(%)	Ant to ITA no.(%)	Between branches of ITA No.(%)	Other relations No. (%)
Females (52)	31 (62%)	16 (31%)	4 (7.6%)	1 (1.9%) encircalage
Males (12)	7 (58%)	3 (33%)	1(8.3%)	1 (8.3%) non recurrent

Table-IV: Comparison of different studies.

Author	year	country	No. of nerves studied	Nerve ant to Artery (% age)	Nerve post to Artery (% age)	Nerve between branches (%age)
Reed	1943	USA	506	18.6	30.1	36.5
Bowden	1955	UK	58	18.97	41.38	34.88
Chang chen	1980	Taiwan	100	24	56	20
Hirata	1992	Japan	784	18.65	46.25	35.1
Costa et al	1997	Brazil	98	37.76	40	22.44
Sturniolo etal	1999	Italy	280	31.1	43.2	25.7
PV Pardeep	2012	India	584	25	65	8.2
Saadeldin A	2013	Sudan	164	37.2	38.5	24.3

Considering the right and left side separately

relationship with the RLN[19]. The knowledge of these various relations is important for safe thyroid surgery. The relationship of RLN with ITA has been studied in many ways by different authors but majority have classified them as passing anterior, posterior and between the branches of ITA. We followed more or less the same pattern. The relationship of RLN with ITA varies. In our study the nerve most commonly passed behind the artery in 65% cases, superficial to the artery in 28% cases and in 5% cases it passed between the branches of inferior thyroid artery. This is in contrast to one local study which shows 34.67% posterior relation, 55.27% anterior relation and 10.05% in between the branches[20]. Number of other studies reveal that the nerve is more frequently located posterior to ITA 24.47% to 75.58% followed by anterior location and between the branches least frequently which is in line with our study. Table-IV, Dai *et al* found that nerve passes posterior to artery in 62% of cases. Other studies reveal more frequent anterior relation followed by between the branches[6,26] Saadeldin *et al*[20] found nerve passing between the branches more frequently, 30% cases, followed by anterior to the artery. Nyeki *et al*[21] found that nerve passes posterior to artery in 64.5% of cases. LUD *et al*[22] found in 78 cases study that nerve passes posterior in 43% cases and in between the branches in 35% cases. Page *et al*[23] in 271 thyroidectomies found that RLN on right side passes anteriorly more frequently and on left side passes behind the artery more frequently. Compose and Herniques 6 compared the data from 17 studies and revealed considering the two sides together that RLN pass more frequently located posterior to the ITA between 39.1% and 75.6%. Polendnak[24] analysed several studies and revealed that nerve passes more frequently behind the artery on left side while nerve on the right side has almost equal chance of anterior, posterior or between the branches. This is in contrast to Yalcxins, study[25] who revealed on right side the nerve passes in front of artery more frequently and posterior to artery on left side. Mi Sun lee[26], in a study of 70 cadavers revealed that on right side the nerve passes in front of artery more frequently and posterior to artery on left side.

CONCLUSION

Relationship of RLN with ITA is variable in our population. The surgeon should be aware of these variations and meticulous dissection of RLN is mandatory in tumor surgery and redoes thyroid surgery to avoid injury to these nerves.

CONFLICT OF INTEREST

This study has no conflict of interest to declare by any author

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