

Recurrent Laryngeal Nerve Palsy and Hypocalcemia with and without Bilateral Ligation of Inferior Thyroid Artery in Total Thyroidectomy

Mazhar Iqbal, Sughra Parveen

ABSTRACT

Objective To find out frequency of recurrent laryngeal nerve palsy and hypocalcemia with and without bilateral ligation of inferior thyroid artery (ITA) in total thyroidectomy.

Study design Descriptive case series.

Place & Duration of study Department of General Surgery ward 3, Jinnah Postgraduate Medical Center Karachi, from April 2010 to April 2015.

Methodology All patients of non toxic multimodular goitre who had indication for surgery were included. Patients were divided in two groups. In group I patients ITA was ligated and in group II it was left alone during total thyroidectomy. Postoperatively serum calcium level was done after 24 hours, 48 hours and on Day 7. Voice changes were also noted. If hypocalcemia and voice changes recovered within 6 months then the condition was labeled as transient phenomenon. If changes persisted then it was considered permanent insult.

Results There were 100 patients of non toxic multimodular goitre in this series. Age range was from 12 year to 65 year. In each group there were 48 females and 2 males. In group I 12(24%) patients developed transient hypocalcemia and 3(6%) had transient recurrent laryngeal nerve palsy. In group II 10(20%) developed hypocalcemia and 7(14%) had recurrent laryngeal nerve palsy. All were transient in nature

Conclusion The frequency of hypocalcemia and recurrent laryngeal palsy was less in patents with bilateral ITA ligation.

Key words Multinodular goitre, Hypocalcemia, Total thyroidectomy, Recurrent laryngeal nerve palsy.

INTRODUCTION:

Permanent hypocalcemia following thyroidectomy causes considerable morbidity. Theodar Kochar is credited with refining the technique of thyroidectomy and reducing the incidence of post operative hypocalcemia.¹ Postoperative hypocalcemia is relatively frequent situation after sub-total thyroidectomy and its incidence is as high as 83%.² It can be transitory with regression in 6 months and in some cases permanent. It is very unpleasant

situation for patients. At times it can be life threatening. Some authors have questioned bilateral ligation of ITA in sub-total thyroidectomy which is recommended to decrease the bleeding.³ It is known that all blood supply to 4 parathyroid glands comes from ITA.⁴ It is logical inference that this procedure would increase postoperative hypocalcemia.

The frequency of transient recurrent laryngeal nerve palsy (RLNP) is reported as 3% in thyroidectomy procedure. It usually recovers in 3 weeks to 3 months. The permanent RLNP rate ranges from 0.1% to 5.8%.⁵ Variability of ITA and its position related to recurrent laryngeal nerve, makes it a poor surgical landmark. The advantage of preventing the disruption of blood supply to inferior parathyroid glands can lead to iatrogenic injury to recurrent laryngeal nerve

Correspondence:

Dr. Mazhar Iqbal
Department of General Surgery, Ward-3
Jinnah Postgraduate Medical Center
Karachi
Email: mazharsgr@hotmail.com

because of its close proximity to branches of ITA.⁵

Surgical technique is one of the important factors in effecting the outcome of thyroidectomy. Truncal ligation of ITA prevents the bleeding and lowers the incidence of iatrogenic injury to recurrent laryngeal nerve but causes the ischemic injury to the parathyroid gland theoretically. Ligation of ITA versus no ligation is still controversial. The purpose of this study was to find out the frequency of recurrent laryngeal nerve palsy and hypocalcemia in total thyroidectomy after bilateral ligation of ITA versus not ligation of this vessel.

METHODOLOGY:

This descriptive case series was conducted at the Department of General Surgery Ward-3, Jinnah Postgraduate Medical Center Karachi, from April 2010 to April 2015. All patients of non toxic multinodular goitre (MNG) who needed surgery were included. Patients with recurrent goitre, thyroid malignancy, low preoperative serum calcium, were excluded. Preoperative indirect laryngoscopy (IDL) and serum calcium level and all the baseline investigations were done.

Patients were divided into two groups. In group I truncal ligation of ITA was done and in group II it was left alone. Lateral mobilization of thyroid was done by the capsular dissection technique indentifying parathyroid glands and recurrent laryngeal nerve. Vocal cards were reassessed after extubation by direct laryngoscopy. Postoperatively all patients were assessed for hypocalcemia by symptoms and sings like weakness, fatigue, paralysis, cramps, anxiety, Chovestek and Trousseau signs. Voice changes of the patients were noted. Serum calcium was estimated after 24 hours, 48 hours and on 7th postoperative day. Hypocalcemia was diagnosed when serum corrected calcium level dropped below 8 milligrams /dl. Serum PTH level was done in hypocalcemic patients. Hypocalcemia was treated with intravenous calcium.

Patients who developed complications were followed up weekly for three months and then monthly for one year. Serum calcium was estimated on each visit and voice changes were assessed. All patients were treated conservatively. If hypocalcemia and recurrent laryngeal nerve palsy did not recover in six months it was considered permanent damage and if recovered in 6 months it was considered as transient phenomenon. Patients with permanent recurrent laryngeal nerve palsy were planned to send to the ENT department. Data was entered into SPSS version 20. Statistical analysis was done using descriptive statistics with numbers,

percentages and proportions.

RESULTS:

A total of 100 patients of non-toxic MNG were included in the study. The mean age was 35+10 year. Age range was 12 year to 65 year. Most of the patients were between 21 year to 40 year of age. There were 96 females and 4 male patients. In group I with bilateral ligation of ITA, 48 patient were females and 2 males. In this group 12(24%) patients developed hypocalcemia and serum PTH was low in 10(20%) patients. Perioral numbness and tetany was noted in 10(20%) while 2(4%) patients had asymptomatic hypocalcemia. All of these patients recovered from hypocalcemia. Ten patients recovered in one month and two in four months. Thus hypocalcemia was transient in this group. In group I 3(6%) patients developed recurrent laryngeal nerve palsy. Nerve palsy was transient. These patients showed subjective changes in voice quality and hoarseness. All patients recovered in three months.

In group II there were 48 females and 2 male patients. No ligation of ITA was done in this group. Ten (20%) patients developed postoperative hypocalcemia of whom nine (18%) were symptomatic. This hypocalcemia was transient and all patients recovered in two months. In the same group 7(14%) patient reported voice changes. This voice change was transient and all patients recovered in 3 months (table I).

DISCUSSION:

Patients with unilateral vocal fold paralysis presents with postoperative hoarseness of voice. Bilateral vocal fold paralysis may occur after total thyroidectomy and usually manifests immediately after extubation. Both vocal folds remains in paramedian position causing partial airway obstruction resulting in stridor. Deliberate identification of recurrent laryngeal nerve minimizes the risk of injury. The reported incidence of recurrent laryngeal nerve injury after identification is between 0.2-1%. The risk is higher if surgery is repeated (2-12%) or if nerve is not clearly identified (4.62-6%).⁶

The course of recurrent laryngeal nerve differs on right and left side of the neck. The left recurrent laryngeal nerve branches from vagus at the level of aortic arch. It passes below the arch and then travels in tracheoesophageal groove and enters the larynx near cricothyroid articulation. The right recurrent laryngeal nerve loops the subclavian artery and ascends superomedially and continues uperiorly in tracheoesophageal groove to reach the cricothyroid articulation.

Table I: Recurrent Laryngeal Nerve Palsy and Hypocalcemia In Total Thyroidectomy

Group I ITA Ligated n = 50				Group II ITA Not Ligated n = 50		
Age (Year)	No. of Patients (n)	Hypocalcemia Transient (n)	RLNP Transient	No. of Patients	Hypocalcemia Transient	RLNP Transient
12-20	02	0	0	01	0	1
21-30	15	5	1	16	4	3
31-40	25	6	1	24	5	2
41-50	05	1	1	05	1	1
51-60	02	0	0	03	0	0
60-65	01	0	0	01	0	0
Total	50	12 (24%)	3 (6%)	50	10 (20%)	7 (14%)

The right recurrent laryngeal nerve course is relatively oblique and it may be non-recurrent. On the right side it runs between the branches of ITA in 50% of the cases, anterior to the artery in 25% and posterior to the artery in 25%. On the left side nerve runs between the branches of ITA in 35%, posterior to the artery in 50% and anterior in 15%.⁶ So nerve is always near to the artery. The berry ligament attaches the thyroid to trachea at the level of 2nd or 3rd tracheal ring. This is the most common site of nerve injury. Nerve passes through the ligament thus extreme care is needed in this area during surgery.

Recurrent laryngeal nerve palsy (RLNP) may be permanent or transient. Transient paralysis occurs in 3% and recovers in three months.⁷ In this study the transient paralysis of RLN was noted in 6% when ITA was ligated and 14% when ITA not ligated. It was comparatively high but injury was transient and all the patients recovered as well. Neural disruption may be mediated by iatrogenic means like thermal damage, sharp dissection, ischemia, stretching, retraction and compression. In this study nerve injury was transient. Most of the cases had huge non-toxic MNG which needed a strong retraction. Thus stretching of nerve may have occurred. None had suffered permanent nerve injury. Patients in whom ITA was not ligated, recurrent laryngeal nerve injury was more (14%). This may be due to more manipulation and traction. In this study nerve was identified in all the cases during surgery.

Postoperative hypocalcemia is relatively frequent situation after thyroidectomy and incidence is about 83%.² Some surgeons questioned the bilateral ligation of ITA in total thyroidectomy to decrease the bleeding.⁸ It is known that almost all the blood supply to four parathyroid glands comes from ITA.⁴

So ligation will increase the incidence of hypocalcemia. This study showed the results against the above observation. A study conducted in Pakistan reported 17% frequency of hypocalcemia was found when ITA was ligated and 13% when not ligated.⁹ The reason may be that parathyroid glands regain blood supply after ischemic injury from the surrounding tissue. Sometimes parathyroid glands may be situated in mediastinum or are along the carotid sheath away from the operative field and can escape injury.

A study conducted in India showed an overall incidence of hypocalcemia as 23.6% and permanent of 1.6%.¹⁰ In other study hypocalcemia was 1.84% when ITA was ligated and 1.36% when ITA not ligated.¹¹ In this study permanent hypocalcemia did not occur. Permanent RLNP needs lifelong treatment. Many articles recommend not to ligate the ITA during total thyroidectomy.^{12,13} Those who recommend the ligation of ITA argue that the risk of more intraoperative bleeding and damage of recurrent laryngeal nerve are higher and benefits are theoretical.^{14,15} It has been reported that most hypocalcemic patients are asymptomatic.⁸ In this study most of the patients were symptomatic. In this study transient recurrent laryngeal nerve injury and transient hypocalcemia did occur but permanent damage was not observed thus ligation of inferior thyroid artery resulted in decreased frequency of recurrent laryngeal nerve injury.

CONCLUSIONS:

ITA ligation did not affect the postoperative frequency of hypocalcemia but decrease the frequency of permanent recurrent nerve injury so it is worth adopting this step during total thyroidectomy.

REFERENCES:

1. Mittendorf EA, McHenry CR. Complications and sequelae of thyroidectomy and analysis of surgeon experience and outcome. *Surg Technol Int* 2004;12:152-7.
2. Delattre JF, Flament JB, Palot JP. Les variations des parathyroïdes. *J Chir (Paris)* 1982;119: 633-41.
3. Perinetti HA, Via E. Complicaciones de la cirugía tiroidea: nervi recurrente y glándula paratiroidea. *Rev Argent Cirug.* 1988;54:69-74.
4. Wingert DI, Friensen SR, Iliopoulos JI. Post-thyroidectomy hypocalcemia. *Am J Surg.* 1986; 152: 608-10.
5. Chiang FY1, Wang LF, Huang YF, Lee KW, Kuo WR. Recurrent laryngeal nerve palsy after thyroidectomy with routine identification of the recurrent laryngeal nerve. *Surgery.* 2014;137:342-7.
6. Pesce CE, Shiue Z, Tsai HL, Umbricht CB, Tufano RP, Dackiw AP, et al. Postoperative hypocalcemia after thyroidectomy for Graves disease. *Thyroid.* 2010;20:1279-83.
7. Abboud B, Sleilaty G, Mallak N, AbouZeid H, Tabchy B. Morbidity and mortality of thyroidectomy for substernal goiter. *Head Neck Surg.* 2010;32:744-9.
8. Paineau H, Hingrat JY, Lehur PA. Le risque parathyroïdien dans la chirurgie thyroïdienne. Valeur de la reimplantation parathyroïdienne. *J Chir (Paris).* 1984;121: 25-32.
9. Araujo-Filho VJF. The importance of the ligation of the inferior artery in parathyroid function after subtotal thyroidectomy. *Rev Hosp Clin Fac Med S Paulo.* 2000;55:113-20.
10. Nair CG, Babu MJ, Menon R, Jacob P. Hypocalcaemia following total thyroidectomy: An analysis of 806 patients. *Indian J Endocr Metab.* 2013;17:298-303.
11. Chaudhary IA, Afridi ZD, Samiullah, Masood R, Mallhi AA. To ligate or not the inferior thyroid artery to avoid hypocalcemia after thyroid surgery. *J Ayub Med Coll Abbottabad.* 2007;19:19-22.
12. Thompson NW, Olsen WR, Hoffman GI. The continuing development of the technique of thyroidectomy. *Surgery.* 1973;73:913- 27.
13. Falk SA, Birken EA, Baran DT. Temporary postthyroidectomy hypocalcemia. *Acta Otolaryngol Head Neck Surg.* 1988;114:168-74.
14. Reyes HM, Wright JK. Prevention of hypocalcemia in children due to parathyroid infarction after thyroidectomy. *Surg Gynecol Obstet.* 1979;148:76- 8.
15. Murley R - Hypocalcemia after subtotal thyroidectomy for thyrotoxicosis. *Br J Surg.* 1985;72:77.