International Journal of Medical and Health Research
ISSN: 2454-9142
Received: 27-11-2019; Accepted: 28-12-2019; Published: 29-01-2020
www.medicalsciencejournal.com
Volume 6; Issue 1; 2020; Page No. 148-153

Clinical assessment of postoperative complications in patients undergoing the total thyroidectomy for benign thyroid diseases

Dr. Sarthak Kumar[1], Dr. Chitranjan Kumar[2*]
[1, 2] Junior Resident, Department Of General Surgery, Nalanda Medical College and Hospital, Patna, Bihar, India
[*] Corresponding Author: Dr. Chitranjan Kumar

Abstract
Thyroid disorders are one of the most common cause of metabolic disturbances, with surgery forming the main stay of treatment of thyroid swellings. Thyroid surgery in the hands of experienced surgeons is currently one of the safest procedures performed. While complications following thyroidectomy are rare, their consequences can often be debilitating and even life threatening when they occur. The major complications include postoperative haemorrhage, wound infection, hypocalcaemia, respiratory obstruction, thyroid storm, hypo parathyroidism and laryngeal nerve injuries. Hence based on the above findings the present study was planned for Clinical Assessment of Postoperative Complications in Patients Undergoing the Total Thyroidectomy for Benign Thyroid Diseases.
The present study was planned in Department of General Surgery, Nalanda Medical College and Hospital, Patna, Bihar. Total 50 cases of the thyroidectomy were enrolled in the present study. Depending on the diagnosis either total thyroidectomy, subtotal thyroidectomy or hemi thyroidectomy was done. Wound closure was done after securing complete haemostasis. A 3.0 absorbable (Catgut or Vicryl) suture was used to close the wound. All patients were admitted and monitored for at least 24-48 hours after surgery. indirect laryngoscopy was done for them, and their calcium was monitored regularly, and in case of calcium drop below 8 mg / dl, or incidence of symptoms of hypocalcaemia shuch as numbness and pare sthesia around the mouth and fingers and the positive results of the Trousseau and Chvostek tests, calcium treatment started and all data were recorded in the medical files.
The surgeon knowledge and skills and the accurate dissection of operation field and paying attention to hemodynamic and homeostasis before, during and after the surgery are among the key factors in reducing the incidence of transient or permanent complications and mortality.

Keywords: postoperative complications, total thyroidectomy, benign thyroid diseases, Bihar region, etc

Introduction
The thyroid gland has been described throughout history but was first so named by the Romans for being a "shield-shaped" gland. Not only were thyroid masses mentioned in the literature throughout the 12th and 13th century, but in 1170 Robert Frugardi described the extirpation of a goiter. Thyroid surgery was undertaken well before thyroid gland physiology was understood. The procedures were often fraught with complications, including massive hemorrhage, infection, and injury to surrounding structures, all of which were associated with morbidity and mortality rates of nearly 40%.
Even in the 19th century, thyroid surgery was considered barbaric, described by Samuel Gross as "horrid butchery," and banned by the French medical society due to its high mortality. As technology improved and with the advent of aseptic technique, mortalities associated with these surgeries decreased [1]. During the 1850s, operations on the thyroid gland were undertaken via longitudinal, oblique, or vertical neck incisions. Jules Boeckel of Strasbourg introduced the collar incision to thyroid surgery in 1880, and this approach was popularized by Theodore Kocher. Theodor Kocher, whose own reported mortality rate for thyroidectomy dropped to 1%, was awarded the Nobel Prize in 1909 for his advancement of thyroid surgery in the late 19th century [2, 3].
The surgical technique of thyroidectomy, as well as adjunct technology, continued to advance. Most recently, various new instruments (ie, harmonic technology) and approaches including video-assisted thyroidectomy and robot-assisted thyroidectomy have emerged. This chapter discusses the preoperative evaluation, intraoperative considerations, surgical technique(s), and postoperative concerns for patients undergoing thyroidectomy.
Various indications for thyroidectomy exist. One of the major indications is a diagnosis of thyroid cancer, usually biopsy-proven by fine-needle aspiration of a nodule.
Although the full range of thyroid nodule histology is beyond the scope of this chapter, the histology can have significant ramifications as to chosen operative management. In patients with all but the most minimal (low-risk) biopsy-proven papillary thyroid cancer, and all medullary thyroid cancer, a total thyroidectomy is indicated. Patients with a fine-needle aspiration showing either Hürthle cells or follicular neoplasm require at least a thyroid lobectomy of the side ipsilateral to the nodule and possibly a total thyroidectomy if the permanent operative specimen shows signs of malignancy. In addition to these malignancies, anaplastic thyroid cancer can occasionally be an indication for thyroidectomy, if no significant extension and infiltration into the surrounding structures is found [4].
Beyond malignancies, thyroidectomy is also a viable option for patients with symptomatic thyroid masses or goiters.

Patients who have compressive symptoms including dysphagia, dyspnea, shortness of breath, and/or hoarseness due to a large goiter should undergo a thyroidectomy. Usually dysphagia to solids is the earliest presenting symptom. Aesthetic concerns due to a goiter may be an indication for thyroidectomy. Another indication includes patients with medically refractory Graves disease or hyper thyroidism [5].

Uncontrolled severe hyperthyroidism (ie, Graves disease) is a relative contraindication to surgery due to concerns for intraoperative or postoperative thyroid storm. Although thyroidectomy can be performed during pregnancy for malignancy, many authors cite postponing surgery until after delivery if possible, secondary to risks to the fetus from the anesthesia. Indications for surgery during pregnancy include aggressive cancers or airway compromise. If elective thyroid surgery is undertaken during pregnancy, it should be performed during the second trimester if possible [6, 7].

The thyroid gland starts developing on approximately the 24th day of gestation from endodermal epithelial cells on the median surface of the pharyngeal floor—the foramen cecum. It develops caudal to the median tongue bud, which arises from the first pharyngeal arch, and rostral to the copula, which develops from the second pharyngeal pouch. By the seventh gestational week, the thyroid gland descends anterior to the hyoid bone, thyroid cartilage, and cricoids cartilage to rest anterior to the trachea. The path of descent is marked by the thyroglossal duct, a tubular structure of thyroid tissue, that usually obliterates completely between the 7th and 10th gestational week. However, a persistence of the inferior-most aspect of this duct is present in as many as 50% of patients in the form of the pyramidal lobe [8, 9].

The fully developed thyroid gland is composed of 2 lateral lobes and a central isthmus with or without a pyramidal lobe (40-50%). The thyroid lies in the middle layer of the deep cervical fascia and is attached from its superior-medial aspect to the thyroid and cricoid cartilages via the anterior suspensory ligament. Berry's ligament (the posterior suspensory ligament) connects the posterior-medial aspect to the first and second tracheal ring and the cricoid cartilage. The sternohyoid and sternothyroid muscles cover the thyroid gland anteriorly. The tubercle of Zuckerkandl extends off of the posterior and lateral aspect of the thyroid lobes [8, 9].

The thyroid gland is a very vascular structure. The major arterial contributions are the superior thyroid artery, a branch off of the external carotid artery, and the inferior thyroid artery, which branches off of the thyro cervical trunk. Lastly, the thyroidea ima artery can provide an arterial supply through the inferior border of the isthmus in 2-12% of patients [10]. It branches from either the innominate, subclavian, right common carotid, internal mammary, or the aortic arch.

The superior, middle, and inferior thyroid veins provide venous drainage and join either the internal jugular or innominate veins. The superior thyroid vein follows the pathway of the superior thyroid artery. The middle thyroid veins directly flow into the internal jugular vein. The inferior thyroid veins can be found just anterior to the trachea and often anastomose with each other. Lymphatic drainage tends to follow venous drainage and leads to the pre laryngeal, pre tracheal, para tracheal, and supraclavicular nodes. The gland is innervated by the superior, middle, and inferior cervical ganglia of the sympathetic trunk, as well as by parasympathetic fibers from the vagus nerve [8, 9].

Reported rates of transient hypocalcemia vary in the literature from between 5-50%, but the rate of permanent hypocalcemia secondary to hypoparathyroidism (ie, lasting more than 6 months) is between 0.5-2 %. The pathophysiology behind transient hypoparathyroidism and hypocalcemia is not well understood but is thought to be related to a transient ischemia to the parathyroid glands or perhaps an increased release of the acute phase reactant endothelin 1 [11]. A systematic review of predictors of post-thyroidectomy hypocalcaemia found perioperative parathyroid hormone (PTH), preoperative vitamin D and postoperative changes in calcium to be biochemical predictors [12]. Patients who are at increased risk for this complication are those with Graves disease or malignancy or those undergoing total thyroidectomy, or total thyroidectomy with central compartment neck dissection.

Patients may initially be asymptomatic while hypocalcemic. Classic presenting symptoms include numbness and tingling of the digits or perioral area, carpopedal spasm, or the presence of a Chvostek sign or a Trousseau sign. In severe cases, patients may also experience tetany, EKG changes (QT prolongation), seizures, mental status changes, or cardiac arrest secondary to hypo calcemia. The Chvostek sign can be reproduced by tapping on the face just anterior to the ear, causing contraction of the ipsilateral facial muscles. A patient with a positive Trousseau sign will have spasm of the wrist, fingers, or thumb with inflation of a sphygmomanometer above the systolic blood pressure. Either sign is indicative of neuromuscular excitability associated with hypo calcemia.

Patients who are noted to have postoperative hypo calcemia should be managed with calcium supplementation. By following the trend of serum calcium levels, oral calcium supplementation can be titrated accordingly. If patients are receiving 2 grams of elemental calcium and continue to have decreasing or low serum calcium, calcitriol supplementation between 0.25-1 mcg per day can be considered. Additionally, intravenous calcium replacement may be necessary for patients refractory to oral management or those with severe symptomatic hypocalcemia. Endocrinology consultation should be considered in these patients. Of note, serum calcium levels should be corrected for concurrent hypo albuminemia and any hypo magnesemia should be medically corrected.

Patients who develop hypo calcemia should be discharged with calcium and vitamin D supplementation and if necessary calcitriol supplementation. After a few months, weaning from the calcium supplementation can be considered.

Injury to the recurrent laryngeal nerve (RLN) can yield vocal fold paresis or paralysis. The implementation of nerve monitoring has not been proven to lower this risk, but may provide prognostic value. Studies show that identifying the RLN is associated with lower rates of injury.

Permanent RLN paralysis occurs in 1-2% of thyroidectomies in experienced hands [13-14]. These cases may be underestimated, as not all patients undergo postoperative laryngeal evaluation. Should an injury occur, the patient usually presents with postoperative persistent hoarseness. Patients may also describe dysphagia or aspiration with thin liquids. Patients who undergo total

thyroidectomy are at risk for bilateral vocal fold paralysis, a devastating complication. This usually manifests in the immediate postoperative period with airway obstruction, biphasic stridor, or respiratory distress.

Patients with suspected recurrent laryngeal nerve injury should be evaluated with flexible laryngoscopy or video strobos copy to confirm the position and movement of the vocal folds. Should they have aspiration or dysphagia symptoms, they should be evaluated by a speech language pathologist. Patients with suspected bilateral vocal fold paralysis may require urgent and definitive airway management with a tracheotomy. Permanent corrective procedures for vocal fold paralysis are not entertained until 9-12 months have passed. At this point, any persistent injury may be considered permanent.

The superior laryngeal nerve has both an internal and external branch. The internal branch provides sensory innervation to the larynx, while the external branch innervates the crico thyroid muscle. This posterior laryngeal muscle assists with lengthening of the vocal fold. Estimates of this complication vary, and are likely underestimated.

Often this injury is relatively asymptomatic. Patients may occasionally experience hoarseness or vocal fatigue. Voice professionals, however, can be significantly affected by this injury, as it affects the ability to produce higher-pitched sounds and thus may affect a singer's upper register. This injury too may be evaluated video strobos copy, as well as laryngeal EMG. Some slight bowing of the affected vocal cord may be present, and the affected vocal cord may be lower than the normal cord. Additionally, EMG shows a deficit in the crico thyroid muscle.

A rare but dangerous complication of thyroidectomy, neck hematomas can form secondary to inadequate hemo stasis or a coagulopathy. Incidence of this complication is approximately 1%, but its occurrence can lead to asphyxiation and airway compromise [15]. When identified on physical examination, the patient must be taken back to the operating room for exploration and achieving hemo stasis. If the patient is in respiratory distress, the surgical wound should be opened and the hematoma evacuated immediately (even at the bedside) and then the patient should be taken to the operating room.

The rates of infection after thyroidectomy have significantly decreased with improvements in technology and aseptic technique and are currently estimated between 1-2% [15]. The usual presentation is a superficial cellulitis with warmth, erythema, and tenderness surrounding the surgical incision. If fluctuance is present, a superficial abscess may also be present. Other signs of infection, such as fever and leukocytosis, without an overlying cellulitis, may point to a deep space neck infection or abscess.

CT imaging can be helpful in evaluating the deep spaces of the neck. Abscess needs to be drained, and the aspirate should be sent for cultures. Patients with a superficial cellulitis need to be on antibiotics that cover gram-positive organisms, while those with abscesses should be placed on broad-spectrum antibiotics until cultures yield specific bacteria.

One of the contraindications for thyroidectomy is a patient with untreated or uncontrolled Graves' disease or hyperthyroidism. One of the rarer complications from thyroid surgery is precipitation of a thyroid storm, which can occur intra operatively or postoperatively. It is thought to occur secondary to thyroid gland manipulation in the operating room in patients with hyperthyroidism. Manifestations include tachycardia, hyperthermia, cardiac arrhythmias, and increased sympathetic output. Awake patients also present with nausea and altered mental status. If untreated, it may precipitate coma and death.

Intra operatively, if signs of a thyro toxic storm develop, the case needs to be halted and the patient needs to be medically managed to reduce sympathetic output. Cooling blankets, beta-blockers, PTU, and iodine should be administered. Postoperatively, the patient may still have signs of thyrotoxicosis and should be continued on preventative medication. Medications can be weaned as thyroid hormone levels decrease.

Thyroid disorders are one of the most common cause of metabolic disturbances, with surgery forming the main stay of treatment of thyroid swellings. Thyroid surgery in the hands of experienced surgeons is currently one of the safest procedures performed. While complications following thyroidectomy are rare, their consequences can often be debilitating and even life threatening when they occur. The major complications include postoperative haemorrhage, wound infection, hypocalcaemia, respiratory obstruction, thyroid storm, hypo parathyroidism and laryngeal nerve injuries. Hence based on the above findings the present study was planned for Clinical Assessment of Postoperative Complications in Patients Undergoing the Total Thyroidectomy for Benign Thyroid Diseases.

Methodology

The present study was planned in Department Of General Surgery, Nalanda Medical College and Hospital, Patna, Bihar. Total 50 cases of the thyroidectomy were enrolled in the present study.

Depending on the diagnosis either total thyroidectomy, subtotal thyroidectomy or hemi thyroidectomy was done. Wound closure was done after securing complete haemostasis. A 3.0 absorbable (Catgut or Vicryl) suture was used to close the wound. All patients were admitted and monitored for at least 24-48 hours after surgery. indirect laryngoscopy was done for them, and their calcium was monitored regularly, and in case of calcium drop below 8 mg / dl, or incidence of symptoms of hypocalcaemia shuch as numbness and paresthesia around the mouth and fingers and the positive results of the Trousseau and Chvostek tests, calcium treatment started and all data were recorded in the medical files.

All the patients were informed consents. The aim and the objective of the present study were conveyed to them. Approval of the institutional ethical committee was taken prior to conduct of this study.

Following was the inclusion and exclusion criteria for the present study.

Inclusion Criteria

Patients diagnosed with goitre undergoing any form of thyroid surgery.

Exclusion Criteria

Patients not willing to be part of the present study were excluded (those who were not willing to stay in hospital for more than 48 hours) from the present study even though they were having goitre and some form of thyroidectomy was done. Patients with malignancy where lymph nodal dissection was carried out along with thyroid surgery.

Results and Discussion

Thyroidectomy is a common operation with an extremely low mortality [16]. It is associated with specific morbidities which are related to the experience of the surgeon, however [17]. Very low surgical morbidity rates for thyroidectomy are reported in specialised centers. In competent hands, thyroid surgery is associated with few complications and no fatality. Post-operative complications may be as insignificant as edema of the flap or as dangerous and life threatening as hemorrhage or respiratory obstruction. The majority are avoidable with sound surgical technique and good preoperative preparation. With proper preoperative management, the patient will be euthyroid at the time of surgery. If the patient is hyperthyroid, laryngeal edema may result, producing respiratory obstruction. Careless technique may result in massive haemorrhage, recurrent laryngeal nerve paralysis, or both, causing respiratory embarrassment. Lack of experience or of attention to technical details may involve removal of too little or too much thyroid tissue or possibly all parathyroids, resulting in myxedema, recurrent hyperthyroidism, or parathyroid deficiency. Bhattacharyya in 2002 in the United States, reported that the malignancy rate in the pathology report of patients underwent thyroidectomy was 52.6% [18], and as seen, papillary carcinoma is the most common cause of thyroidectomy and its prevalence is increasing, like the results of other studies [19-20]. In addition, in the research of Bhattacharyya, as our study, multi-nodular goiter was the most common cause of thyroidectomy after papillary carcinoma, followed by benign adenoma (14.6%) and thyroiditis (8.7%), respectively. However, different values have been reported for them in similar studies. Three common complications of total thyroidectomy include hypo calcemia, recurrent laryngeal nerve injury, and bleeding, which no case of bleeding after the operation was reported in our center fortunately. George Murray and Fox *et al* develop exogenous thyroxin, which help to overcome the problem of post thyroidectomy hypothyroidism, this invention revived the interest of total thyroidectomy among the thyroid surgeons [21-22]. With the aspiration from surgeons like, Halsted who introduced the importance of preservation of parathyroid gland's vascular supply by ligating the tertiary branches of inferior thyroid artery close to the thyroid capsule; Coller and Boyden advocated the preservation of external branch of superior laryngeal nerve by individual ligation of superior thyroid vessels branches, after mobilizing the potential space between the crico thyroid muscle and the medial part of the superior pole of the thyroid and Thompson who advocated the total extra capsular lobectomy, by dissecting the plane between thyroid capsule and thyroid artery. The immediate manifestations of hypocalcaemia are mostly neuro-muscular symptoms and occasionally psychotic states. Ectodermal changes leading on to alopecia, eczema, and cataract may occur as early as 6 months after operation. Persistent hypocalcaemia may cause intracranial lesions and cardiac arrhythmias. Permanent hypocalcaemia causes substantial impact on health of patient along with considerable financial loss. Capsular dissection of thyroid lobes described in detail by Delbridge and Reeve could markedly reduce the incidences of permanent hypocalcaemia [23]. The first author reported a low incidence of 0.4% permanent hypocalcaemia in a large series 2110 operations [24]. The intraoperative assay of intact parathyroid hormone (PTH) was found to be useful in predicting hypocalcaemia after thyroidectomy and is recommended by Australian Society of Endocrine Surgeons [25].

Table 1: Complaints

Complaints	No. of Cases
Nodules in the anterior of neck	41
Pain	1
Dysphagia	2
hoarseness	2
Others (weight loss, sweating, hair loss,...)	4
Total	50

Table 2: Pathological Outcome

Pathological Outcome	No. of Cases
Thyroididtis	4
Multinodular Goiter	11
Papillary Carcinoma	27
Adenoma	6
Others	2
Total	50

Table 3: Complications of surgery

Pathological Outcome	No. of Cases
Vocal cord paralysis	
Transiant	1
Permanents	1
Hypocalcemia	
Transiant	12
Permanents	2
Total	16

Haemorrhagic complications where more frequent in total thyroidectomy (2.56%) when compared to bilateral subtotal thyroidectomy (0.85%) when compared to the results published by Rosato L *et al*. Though the haemorrhagic complication is considerably lower in bilateral subtotal thyroidectomy group (2.1%), 3 it was higher in total thyroidectomy (1.6%). It frequently occurs during the postanaesthetic period when the end tracheal tube is removed. The prevention of post-operative bleeding is dependent on good intraoperative haemostasis. Sound surgical technique is essential [26].

Every effort should be made to preserve parathyroid glands with their own blood supply; however, this may not be sufficient to prevent the occurrence of transient hypoparathyroidism and transient post-thyroidectomy hypocalcaemia, secondary to hypoparathyroidism is common. Delbridge *et al* state that transient hypoparathyroidism should be an accepted outcome of bilateral thyroid surgery rather than a complication. It is noted that the degree and duration of hypocalcaemia increase with the extent of thyroid surgery [27].

The greater incidence of complications with TT is attributable mainly to the greater incidence of transient hypocalcaemia and to a lesser extent to the slightly higher incidence of haemorrhage, whereas the incidences of recurrent laryngeal nerve injuries were slightly higher in bilateral subtotal thyroidectomy. Incidences of other complications are also higher in bilateral subtotal thyroidectomy. Our results concur with the study report published by Rosato *et al* [26].

In malignancy, the extent of surgery is generally high due to regional dissection of lymph nodes. Shen (2010) revealed

that patients underwent lymphatic dissection showed higher rate of complications [28]. Cheah (2002) also stated that the incidence of hypocalcaemia was higher in patients underwent lymphatic dissection and thyroidectomy [29]. Aydin and Kwan in separate studies also referred to the role of lymphatic dissection in papillary thyroid carcinoma in incidence of transient hypo calcemia [30-31].

It can be concluded that a good understanding of thyroid gland anatomy, improved techniques in hemostasis, RLN dissection, preservation of parathyroid glands and postoperative monitoring have caused steady decline in the incidence of postoperative complications following thyroidectomy. In addition appropriate postoperative care with early identification of complications and prompt institution of corrective treatment plays an important role in reducing the duration of postoperative hospital stay and limiting patient morbidity.

Conclusion

The surgeon knowledge and skills and the accurate dissection of operation field and paying attention to hemodynamic and homeostasis before, during and after the surgery are among the key factors in reducing the incidence of transient or permanent complications and mortality.

References

1. Giddings AE. The history of thyroidectomy. J R Soc Med. 1998; 91(33):3-6.
2. Pinchot S, Chen R, Sippel R. Incisions and Exposure of the Neck for Thyroidectomy and Para thyroidectomy. Operative Techniques in General Surgery. 2008; 10:63-76.
3. Jancewicz S, Sidhu S, Jalaludin B, Campbell P. Optimal position for a cervical collar incision: a prospective study. ANZ J Surg. 2002; 72(1):15-7.
4. Lai SY, Mandel SJ, Weber RS. Management of Thyroid Neoplasms. Flint, P; Haughey, BH; Lund, VJ; Niparko, JK; Richardson, MA. Flint: Cummings Otolaryngology: Head & Neck Surgery, 2010, 124.
5. Myers, Eugene. Thyroidectomy. Myers, Eugene. Operative Otolaryngology: Head and Neck Surgery. 2:65.
6. Owen RP, Chou KJ, Silver CE, Beilin Y, Tang JJ, Yanagisawa RT, *et al*. Thyroid and parathyroid surgery in pregnancy. Eur Arch Otorhinolaryngol. 2010; 267(12):1825-35.
7. Kuy S, Roman SA, Desai R, Sosa JA. Outcomes following thyroid and parathyroid surgery in pregnant women. Arch Surg. 2009; 144(5):399-406.
8. Fancy T, Gallagher D 3rd, Hornig JD. Surgical anatomy of the thyroid and parathyroid glands. Otolaryngol Clin North Am. 2010; 43(2):221-7, vii.
9. Bliss RD, Gauger PG, Delbridge LW. Surgeon's approach to the thyroid gland: surgical anatomy and the importance of technique. World J Surg. 2000; 24(8):891-7.
10. Krudy AG, Dopp man JL, Brennan MF. The significance of the thy roidea ima artery in arterio graphic localization of parathyroid adenomas. Radiology. 1980; 136(1):51-45.
11. Nomura K, Yamashita J, Ogawa M. Endothelin-1 is involved in the transient hypo parathyroidism seen in patients undergoing thyroid surgery. J Endocrinol. 1994; 143(2):343-51.
12. Edafe O, Antakia R, Laskar N, Uttley L, Bala subra manian SP. Systematic review and meta-analysis of predictors of post-thyroidectomy hypocalcaemia. Br J Surg. 2014; 101(4):307-20.
13. Gourin CG, Tufano RP, Forastiere AA, Koch WM, Pawlik TM, Bristow RE, *et al*. Volume-based trends in thyroid surgery. Arch Otolaryngol Head Neck Surg. 2010; 136(12):1191-8.
14. Stavrakis AI, Ituarte PH, Ko CY, Yeh MW. Surgeon volume as a predictor of outcomes in inpatient and outpatient endocrine surgery. Surgery. 2007; 142(6):887-99.
15. Watkinson JC. Fifteen years' experience in thyroid surgery. Ann R Coll Surg Engl. 2010; 92(7):541-7.
16. Foster RSJr. Morbidety and mortality after thyroidectomy. Surg Gynecol obstet. 1978; 146:423-9
17. Harness JK, Fung L, Thompson NW, Burney RE, McLeod MK. Total thyroidectomy: complications and techniques. World J Surg. 1986; 10:781-6.
18. Bhattacharyya N, Fried MP. Assessment of the morbidity and complications of total thyroidectomy. Archives of OtolaryngologyHead and Neck Surgery. 2002; 128(4):389-92
19. Abboud B, Sader Ghorra C, Rassy M, El Naderi S, Trak-Smayra V, Abadjian G, *et al*. Epidemiological study of thyroid pathology in a University Hospital. Acta Chirurgica Belgica. 2015; 115(6):414-7.
20. Jacobs JK, Aland JW, Ballinger JF. Total thyroidectomy. A review of 213 patients. Ann Surg. 1983; 197(5):542-9.
21. Delbridge L. Total thyroidectomy: The evolution of surgical technique. ANZ J Surg. 2003; 73:761-8.
22. Dadan J, Nowacka A. A journey into the past-The history of thyroid surgery. Wiad Lek. 2008; 61:88-92.
23. Delbridge L. Total Thyroidectomy: The evolution of surgical technique. ANZ J Surg. 2003; 73:761-8.
24. Bliss RD, Gauger PG. Delbridge LW. Surgeon's approach to thyroid gland-Anatomy and surgical technique. World J Surg. 2000; 24:891-7.
25. AES Guidelines 06/01 Group. Australian Endocrine Surgeons Guidelines, AES06/01. Postoperative Parathyroid Hormone Measurement and Early Discharge after Total thyroidectomy: Analysis of Australian Data and Management Recommendation. ANZ J Surg. 2007; 77:199-202.
26. Rosato L, Avenia N, De Palma M. Complications of total thyroidectomy: incidence, prevention and treatment. Chir Ital. 2002; 54(5):635-42.

27. Demeester-Mirkine N, Hooghe L, Van Geer truyden J. Hypo calcemia after thyroid dectomy. Arch Surg. 1992; 127(7):854-8.
28. Shen WT, Ogawa L, Ruan D, Suh I, Kebebew E, Duh QY, *et al*. Central neck lymph node dissection for papillary thyroid cancer: comparison of complication and recurrence rates in 295 initial dissections and reoperations. Archives of surgery. 2010; 145(3):272-5.
29. Cheah WK, Arici C, Ituarte PH, Siperstein AE, Duh QY, Clark OH. Complications of neck dissection for thyroid cancer. World journal of surgery. 2002; 26(8):1013-6.
30. Aydin OU, Soylu L, Ozbas S, Ilgan S, Bilezikci B, Gursoy A, *et al*. The risk of hypo parathy roidism after central compartment lymph node dissection in the surgical treatment of pT1, N0 thyroid papillary carcinoma. European review for medical and pharmacological sciences. 2016; 20(9):1781-7.
31. Kwan WY, Chow TL, Choi CY, Lam SH. Complication rates of central compartment dissection in papillary thyroid cancer. ANZ journal of surgery. 2015; 85(4):274-8.