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Research Article

Assessment of the Efficiency and Safety of Thyroidectomy versus other Thyroid Surgeries in the Management of Benign Thyroid Disease

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Abstract

Background: Total thyroidectomy has been identified as the treatment of choice for patients with malignant thyroid disease, however he safety and efficacy of total thyroidectomy versus other Thyroid surgical is a matter of debate.

Aim of the study: assess the indications and safety profile of total thyroidectomy as the preferred option in certain benign diseases of the thyroid to prevent recurrence and future operations.

Methods: This is a retrospective review of the scientific literature (PubMed, Cochrane Library, MEDLINE and Embase Search from 1975 to 2005). Identification of papers according to the inclusion and exclusion criteria and data extraction were performed by two independent researchers.

Results: Many retrospective studies and few prospective studies suggest that the incidence of transient hypocalcemia is higher after total thyroidectomy than after subtotal thyroidectomy, but the incidence of other complications including recurrent laryngeal nerve palsy and postoperative hematoma is not significantly different between the two procedures.

Conclusion: When performed by skilled surgeons, total thyroidectomy 'TT' can be a treatment of choice being a safe, with least complication rates and cost effective compared to other Thyroid surgeries.

Keywords: *Thyroid surgery; Thyroid diseases; Total thyroidectomy; Subtotal thyroidectomy; Thyroid diseases; Laryngeal nerve injury*

Introduction

The thyroid is a gland of internal secretion and unique site of several common diseases susceptible to medical or surgical treatments, or a combination of both [1]. The association of high prevalence of thyroid diseases with publications from diverse regions and different schools of surgery often results in heterogeneous information that helps feed the controversy [2]. Thyroid diseases can be grouped into benign and malignant types. In benign cases, the common diseases encountered are thyroiditis (mostly Hashimoto thyroiditis), goiter, thyroid adenoma, and so forth. Total thyroidectomy is a surgical procedure which is performed to treat various thyroid diseases wherein the thyroid gland is removed [3]. The choice of surgery to treat some of thyroid affections is one among many. In this context lies the indication of total thyroidectomy for certain benign diseases, a trend that is gaining adherents in the last two decades [4]. The purposes are to avoid surprises due to a mistaken diagnosis of benignity in intra-operative frozen section examination, eliminating the possibility of a future or even incidental carcinoma, prevent recurrence and reoperation, admittedly more difficult and more prone to complications [5,6] though minimize by some, relying on experience and good surgical technique [7].

The wide range of surgeries proposed to treat benign thyroid disease is a testament to the fact that the debate still rages on as to the ideal and most appropriate surgery in patients afflicted with benign thyroid disease. The surgeries range from the more conservative Bilateral sub-total thyroidectomy (BST) to a Total thyroidectomy (TT) [8]. Total thyroidectomy is an operation that involves the surgical removal of the whole thyroid gland. Near-total thyroidectomy is an operation that involves the surgical removal of both thyroid lobes except for a small amount of thyroid tissue (on one or both sides less than 1.0 mL). Subtotal thyroidectomy leaves 3g to 5g on the less affected side of the thyroid gland [9].

Indications for surgery in these patients include cosmesis, compression related symptoms, hyperthyroidism and a suspicion of malignancy [8]. It should also be considered in cases of nodules with a history of prior irradiation to the head and neck and diffuse toxic goiter [10], where resection can be an excellent treatment, particularly in patients with large goiters and severe ophthalmopathy, in children, in pregnant women and in those with a mental disability [11].

If thyroidectomy is undertaken, care must be taken when ligating the superior and inferior thyroid artery to avoid damage to adjacent nerves. Ligation of the superior thyroid artery close to the superior pole of thyroid gland is considered safe. Safest approach is to identify the branches of superior thyroid artery and avoid ligating the main trunk as in majority of cases superior laryngeal nerve lies close to the main trunk. The external laryngeal nerves run close to superior thyroid artery and recurrent laryngeal nerve runs close to inferior thyroid artery [12]. Surgeons avoid this procedure due to the possible complications associated with it such as permanent recurrent laryngeal nerve palsy or permanent hypoparathyroidism. So, partial or subtotal thyroidectomy is another procedure which is preferred and currently being performed for benign thyroid diseases [13]. In recent years, the use of nerve monitors and stimulators has been advocated but their usefulness still remains highly uncertain. In fact, one study reports that the surgeons were able to use it only to identify superior laryngeal nerve and it did not aid them in the anatomical dissection of recurrent laryngeal nerve [14].

Total thyroidectomy (TT) remains the optimal surgical treatment for high-risk thyroid cancer; yet the rationality of this surgical approach for the treatment of benign multinodular goitre, toxic multinodular goitre and Graves' disease and even controversial for the treatment of low-risk well-differentiated thyroid carcinomas [15].

Materials and Methods

We carried out a retrospective study of patients with benign thyroid diseases operated from January 1997 to December 2009.

Data Sources

Literature searches of PubMed, Cochrane Library, MEDLINE and Embase between 1975 and 2016 were performed.

Study Selection and Criteria

Search terms: 'Benign Thyroid', 'TT', 'Thyroidectomy', 'Indication and/or complications of Total Thyroidectomy', 'Safety' 'effectiveness'.

Search results were screened by scanning abstracts for the following Inclusion Criteria:

- Benign Thyroid
- Randomized controlled trials (RCTs), controlled clinical trials (RCTs), comparative studies

Exclusion Criteria:

Studies with irrelevant endpoints which is effectiveness and complications encountered during thyroidectomy.

Data Extraction

Two reviewers independently reviewed studies, abstracted data, and resolved disagreements by consensus. Studies were evaluated for quality. A review protocol was followed throughout. A total of 33 studies were reviewed.

Results

Searches identified 340 publications in addition to another 9 publications that were found through manual research. After removal of duplicates, abstracts and titles 271 publications were assessed as identified from title and abstract, and 29 papers were excluded. 18 papers full text could not be retrieved and another 89 papers with the same cohort. There were also 102 papers excluded because they did not discuss the present study's relevant endpoint (safety, complications and effectiveness of TT). We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines in reporting the results (Figure 1).

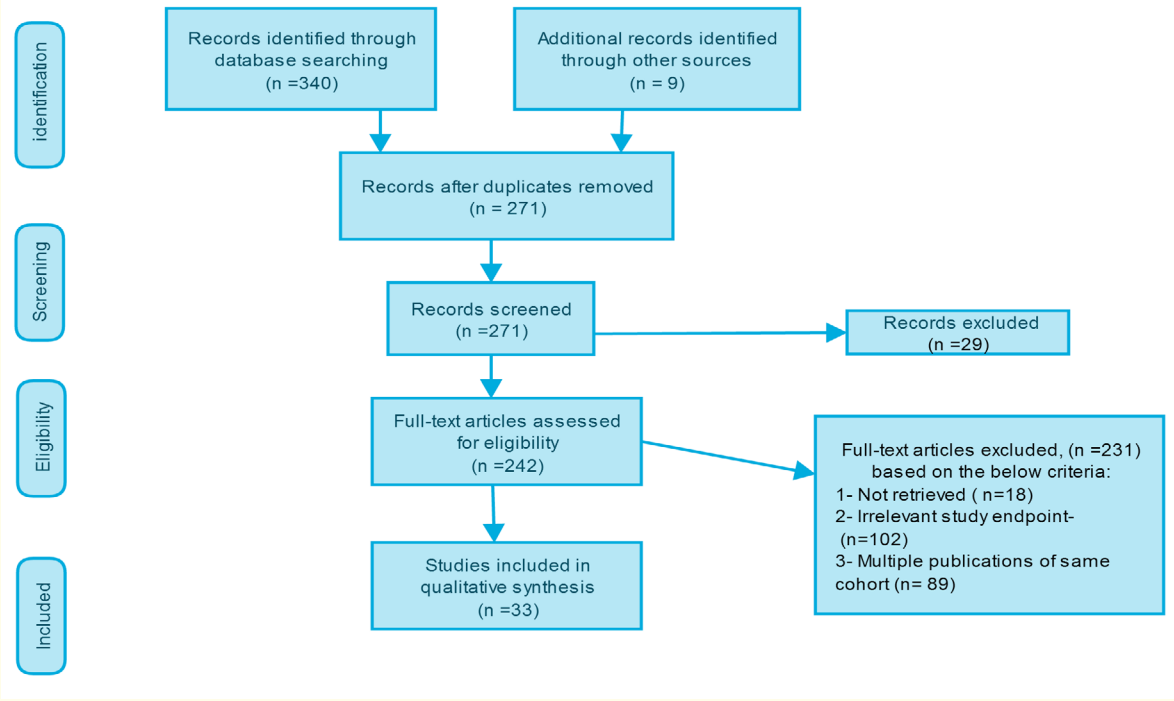

Figure 1: *PRISMA flow diagram of literature search.*

Finally, 33 studies were included and detailed as the focus for the present study.

Few studies reported that requirement of reoperation was significantly less often in total thyroidectomy when compared to subtotal thyroidectomy or hemitotal thyroidectomy. One study [16] reported that rate of transient hypoparathyroidism ranged from 5 to 71% while the rate of permanent hypoparathyroidism ranged from 0 to 3.5%.

On the complications of TT, one study 17 reported recurrent laryngeal nerve palsy and permanent hypoparathyroidism are the most common complications following total thyroidectomy surgery which account for 0.7% and 2.2%, respectively, another study18 reported an incidence of nerve injury which is only 0.4% with no hypoparathyroidism.

Seven studies compared the incidences of recurrent laryngeal nerve injury in total thyroidectomy, subtotal thyroidectomy, near total thyroidectomy, and bilateral subtotal thyroidectomy. They indicate that the complication was higher when performing total thyroidectomy. The results are shown in Table 1.

Study	Year	Surgical Procedure	Incidence of Permanent Recurrent Laryngeal Nerve Injury
Ozbas *et al.*	2005	TT versus NTT	1.9% versus 0.6%
Erbil *et al.*	2006	TT versus NTT	0.9% versus 0.9%
Vaiman *et al.*	2008	TT versus NTT	1.4% versus 1.2%
		TT versus STT	1.4% versus 1.1%
Yang *et al.*	2009	TT versus STT	1.89% versus 1.68%
Tezelman *et al.*	2009	TT versus BST	No significant difference
Vaiman *et al.*	2010	TT versus STT	1.4% versus 1.2%
		TT versus reoperation	1.4% versus 3%
Barczyński *et al.*	2010	TT versus BST	5.49% versus 2.1%

Table 1: *Recurrent laryngeal nerve injury incidence in different thyroid procedures.*

The most common and important observation was that the complication rates were observed to be higher if the surgery was performed by surgeons who are not specialists in endocrine surgery [17].

Studies compared total thyroidectomy with subtotal thyroidectomy were few and mostly provided level IV and some level II evidence that subtotal thyroidectomy is a safer procedure in terms of lesser rates of transient hypocalcemia, even though they had the same rates of permanent complications.

We observed controversial reporting since, few studies reporting high complication rates following thyroidectomy while other studies report very low complication rates. In addition, there are studies which report that there was no significant difference in complication rates among patients who underwent total thyroidectomy when compared with those patients undergoing subtotal thyroidectomy [18,19].

The incidence of permanent recurrent laryngeal nerve palsy in 4 clinical trials was lower for subtotal thyroidectomy compared with total thyroidectomy. Permanent recurrent laryngeal nerve palsy in these studies occurred in 0.8% of subtotal thyroidectomy patients compared to 0.7% of total thyroidectomy patients (p=0.69; n=1275). A review article comparing total thyroidectomy with subtotal thyroidectomy for multinodular goiter indicated that goiter recurrence was lower in the total thyroidectomy group (0.2%) compared to subtotal thyroidectomy group (8.4%) [20].

There was evidence that repeated surgery for recurrent thyroid disease resulted in higher risks when compared to the initial surgery. The incidences of recurrent laryngeal nerve palsy and permanent hypoparathyroidism in such cases are found to be as high as 20.0% and 3.4% [21].

Level IV evidence and few level III evidences reported by prospective studies suggesting that the incidence of transient hypocalcemia is higher after total thyroidectomy than after subtotal thyroidectomy, but the incidence of other complications including recurrent laryngeal nerve palsy and postoperative hematoma is not significant.

The results of the present study concurred with a prospective -systematic review –study by Padur., *et al.* [22].

Discussion

The wide range of surgeries proposed to treat benign thyroid - from the more conservative Bilateral sub-total thyroidectomy (BST) to a Total thyroidectomy (TT)- indicates that debate on the most appropriate surgery in patients afflicted with benign thyroid disease. Indications for surgery in these patients include cosmesis, compression related symptoms, hyperthyroidism and a suspicion of malignancy [23].

The role of Total thyroidectomy for multi-nodular goiter and other benign diseases can be described best as controversial. The only substantial argument for not performing a Total thyroidectomy in these patients is the previously reported higher incidence of complications with increasing extents of thyroid resections [24,25].

In a retrospective analysis done by Rumstadt., *et al.* a total of 253 cases which presented with goitre were reported, of which 134 hemithyroidectomies, 108 hemithyroidectomies combined with subtotal contralateral resection, and 11 total thyroidectomies were performed [26]. This shows that thyroid diseases can be treated surgically using procedures other than total thyroidectomy however, the introduction of capsular dissection and increasing experience with total thyroidectomies has led many surgeons to believe that Total thyroidectomy is more preferable operation in these case [26].

The care of preservation of the recurrent nerve should be observed by all surgeons, as a total thyroidectomy can hardly be held safely without identifying it to the fullest extent. In special situations where its dissection appears very difficult, a section of the isthmus of the thyroid and its release in the mediolateral direction can be helpful. Possibly, surgical trauma secondary to exposure of the nerves explain that seven (13.4%) of patients had mild dysphonia or transient hoarseness, although in two they could be considered serious. Except in situations that interfere with breathing, we only considered the indication for examination of the vocal cords after 30 days if the complaints remained [27].

According to Thomusch., *et al.* [28], The prevalence of postoperative hypocalcemia following thyroidectomy ranges from 0% to 83% with the highest incidence seen in patients undergoing total thyroidectomy for cancer (28%) and in those who underwent subtotal thyroidectomy for thyrotoxicosis (23%). On the other hand, the incidence of hypocalcemia is found to be lowest in patients undergoing subtotal thyroidectomy for other diseases (1.5%) and lobectomy (0%).

In a study done by Pradeep., *et al*. [29], incidences of complications of thyroidectomy were permanent vocal cord palsy (1%), permanent hypocalcemia (3%), and temporary hypocalcemia (24%) . When parathyroids are incidentally removed, or the tumor invades the capsule and end artery of parathyroid, hypocalcaemia is expected to take place [30,31].

Proponents of a more conservative option such as a near total (NTT) or BST are backed by the potentially lesser incidence of dreadful complications like Recurrent Laryngeal Nerve (RLN) palsy and hypoparathyroidism along with the possibility of attaining a drug free postoperative euthyroid state in these patients [24]. However, they are deterred by a significant risk of disease recurrence and that a number of patients with BST also require thyroxine supplementation. Furthermore, proponents of TT argue that with careful surgical technique, complication rates are similar in both BST and TT [25]. They are also backed by the fact that a repeat thyroid surgery is a potentially nightmarish situation that every surgeon wishes to avoid [32,33]. The discovery of incidental malignancies of the thyroid on histopathology also favour the performance of TT over BST or NTT. Bottom-line, most of articles have stressed the fact that total thyroidectomy is safe and had fewer complications when compared to subtotal or partial thyroidectomy.

Conclusion

When performed by skilled surgeons, total thyroidectomy "TT" can be a safe and optimal procedure in the management of benign thyroid diseases with complication rates similar to those of more conservative thyroid surgeries. Totally exposing the parathyroid gland and laryngeal nerve is the key point to prevent the major complications hence, surgeons' skills remain of paramount importance in avoiding perioperative morbidity.

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