ORIGINAL ARTICLE

Role of Microscope in Total Thyroidectomy for Multinodular Goiter

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ABSTRACT

Objective: To compare the incidence of post-operative hypocalcemia and RLN injury in patients undergoing thyroidectomy for multinodular goiter with versus without microscope.

Material and Methods: The randomized controlled study was conducted in the department of Otorhinolaryngology, HBS Teaching Hospital, Islamabad over 1 year from Jan 2017 to Dec 2017. A total of 92 patients both males and females aged between 18 to 70 years planned for thyroidectomy for nodular thyroid enlargement. These cases were randomly assigned into 2 treatment arms. Patients in one group underwent conventional thyroidectomy while those in the other group underwent microscopic thyroidectomy. The results were analyzed in terms of frequency of post-operative hypocalcemia and RLN injury which were observed and compared between the groups. An informed written consentFto participate infthe study was taken from every patient.

Results: Them mean age of the patients was 36.4±13.4 years. We observed a female predominance among these patients with maleFto female ratio of 1:4.1. Following surgery, the frequency of post-operative hypocalcemia (4.3% vs. 15.2%; p-value=0.079) and RLN injury (2.2% vs. 6.5%; p-value=0.307) was lower in patientsHwho underwent microscopic thyroidectomy as compared to conventional thyroidectomy.

Conclusion: Microscopic thyroidectomy was associated with significantly lower frequency of post-operative hypoparathyroidism andFrecurrent laryngealBnerve injury. It is therefore advisable that microscopic thyroidectomy should be preferred in future surgical practice provided the necessary hardware and skills are available.

Keywords: Thyroidectomy, Complications, Microscopic Surgery

INTRODUCTION

Goiter is the thyroid gland's enlargement which may result from a number of conditions[1]. Nodular goiter is one of the most frequent thyroid endocrine disorders[1,2]. It is frequently seen in certain regions and populations particularly those where iodine deficiency is endemic[3]. The mostFfrequent intervention in endocrinefsurgery is thyroidectomy. The operation is safe with low morbidity and nearly 0% mortality when performed in specialized centers[4]. Complications are inversely proportional to the operating surgeon's experience and are directly correlated to the extent of the surgical dissection and resection[5]. Among the various complications, the two most feared and grave complications are hypoparathyroidism and injury to recurrent laryngeal nerve (RLN)[1,5].

Injury to the recurrent laryngeal nerve (RLN) represents a major and feared complication of thyroidectomy. Recurrent nerveDdamage after thyroid surgery varies between 0 and 11%[6]. Factors that are associated with an increasedFlikelihood of postoperative RLN paralysis are the extent of thyroid resection, the surgeon's experience, reoperative surgery, and malignancy[1,3]. The best way to avoid injury to RLN is a good understanding of 3 dimensional anatomy as well as meticulous dissection[6].

Hypoparathyroidism is a serious complication of thyroidectomy that is related to the inadvertent removal of the parathyroid glands, damage to the glands, or the interruption of their blood supply[7]. The occurrence of this complication is related to the expertise of the surgeon in preserving vascularized parathyroid tissue[3,7]. The ideal way toTpreserve the parathyroidFglands in situ is the extracapsularRdissection of the thyroid gland[7].

There have been considerable developments in the field of endoscopic and microscopic surgery. Utilization of microscopes and magnifications loops has enabled surgeons to identify and save previous soft tissue components during radical surgeries[8]. A few reports on utilization of microscopic dissection in thyroidectomy reported a decline in the incidence of post-operative hypoparathyroidism and RLN injury[8,9,10]. We recently started microscopic endocrine surgery at our setup. The purpose of the current study was an audit of our performance and to analyze if addition of microscopic dissection could really help in improving the post-operative outcome among patients undergoing thyroidectomy.

MATERIAL AND METHODS

This was a single blind RCT which was performed at the Otorhinolaryngology, HBS Teaching Hospital, Islamabad over a period of 1 year from Jan to Dec 2017. Sample size of 92 patients (46 patients in each group) was calculated by taking confidence interval as 95%, power of test as 80% along with expected frequency of transient hypocalcemia to be 1.7% with and 12.5% without microscope[9]. Both male and female patients aged between 18-70 years presenting with multinodular goiter and planed for thyroidectomy were involved in this study. Patients with previous neck surgeries, pre-existing hypocalcaemia, renal dysfunction and patients undergoing concurrent neck dissection were omitted. Routine preliminary clinical examination was done including complete ear, nose and throat examination, blood tests, indirect laryngeal examination, neck ultrasound,

thyroid profile and needle aspiration cytology. These patients were allocated into two treatment arms randomly using lottery method. Patients in the first group underwent conventional thyroidectomy under direct vision while those in the second group underwent microscopic thyroidectomy. 24 Hours after the surgery, serum calcium level was acquired and hypocalcemia was labeled if it was <8mg/dl. Post-operatively recurrent laryngeal nerve was assessed clinically and diagnosis of injury was confirmed on vocal cord paralysis on indirect laryngoscopy. All the data was recorded into the attached proforma along with age and gender and BMI of the patient. AllFthe procedures were performed by a singleFsurgical team with expertise in endocrine surgery and demographic details and outcome variables were assessed on the same chart to eliminate bias and confounding variables were controlled by exclusion.

All the collected data was entered into andZanalyzed usinggSPSS Version 20.0. Frequency of post-operative hypocalcemia and RLN injury have been compared between the groupsFusing chi-squareGtest taking p-value ≤0.05 as statistically significant.

RESULTS

The age of the subjects ranged from 18 years to 70 years with a mean of 36.4±13.4 years. Majority (n=53, 57.6%) of the subjects were aged between 26-50 years, followed by 25 (27.2%) patients aged ≤25 years and 14 (15.2%) patients aged >50 years. There were 18 (19.6%) male and 74 (80.4%) female subjects with a male to female ratio of 1:4.1. The BMI of these subjects ranged from 21.2 Kg/m^2 to 34.4 Kg/m^2 with a mean of 26.9±3.8 Kg/m^2. 23 (25.0%) subjects were obese as shown in Table 1.

Table 1: Baseline characteristics of studied subjects

Characteristics	Participants (n=92)
Age (years)	36.4±13.4
• ≤25 years	25 (27.2%)
• 26-50 years	53 (57.6%)
• >50 years	14 (15.2%)
Gender	
• Male	18 (19.6%)
• Female	74 (80.4%)
BMI (Kg/m^2)	26.9±3.8
• 20-25 Kg/m^2	37 (40.2%)
• 25-30 Kg/m^2	32 (34.8%)
• 30-35 Kg/m^2	23 (25.0%)

Table 2: Baseline characteristics of studied groups

Characteristics	Conventional Thyroidectomy n=46	Microscopic Thyroidectomy n=46	P-value
Age (years)	36.20±13.29	36.63±13.58	0.877
• ≤25 years	13 (28.3%)	12 (26.1%)	0.842
• 26-50 years	27 (58.7%)	26 (56.5%)	
• >50 years	6 (13.0%)	8 (17.4%)	
Gender			
• Male	10 (21.7%)	8 (17.4%)	0.599
• Female	36 (78.3%)	38 (82.6%)	
BMI (Kg/m^2)	26.81±3.71	26.92±3.93	0.894
• 20-25 Kg/m^2	19 (41.3%)	18 (39.1%)	0.965
• 25-30 Kg/m^2	16 (34.8%)	16 (34.8%)	
• 30-35 Kg/m^2	11 (23.9%)	12 (26.1%)	

Both the study F groups were comparable in-terms of mean age (p-value=0.877), mean BMI (p-value=0.894) and distribution of various subgroups based on age (p-value=0.842), gender (p-value=0.599) and BMI (p-value=0.965) as shown in Table 9.2. The frequency of hypocalcemia (4.3% vs. 15.2%; p-value=0.079) and RLN injury (2.2% vs. 6.5%; p-value=0.307) was lower in the microscopic group as compared to conventional thyroidectomy. However the difference was not statistically significant as shown in Table 3.

Table 3: Incidence of hypocalcemia and RLN injury between the studies groups.

Outcome Measure	Conventional Thyroidectomy n=46	Microscopic Thyroidectomy n=46	P-value
Hypocalcemia	7 (15.2%)	2 (4.3%)	0.079
RLN Injury	3 (6.5%)	1 (2.2%)	0.307

DISCUSSION

The surgical treatment of MNG (multinodular goiter) has been debatable over the years. Some authors back total thyroidectomy while others support subtotal thyroidectomy leaving approximately 3-4 grams of remnant thyroid on one or both sides[1]. All above procedures have been utilized for almost 100 years and have proven safe particularly in specialized centers[1-3]. However sometimes complications may result, and the most common complications are hypocalcaemia, paresis of the RLN, postoperative bleeding and infection[3]. Post-operative hypoparathyroidism and RLN paresis though common and serious complications can be avoided by fine and careful surgical dissection and its where microscopic surgery comes to play[1,3,6,7]. Use of a microscope or magnification can help in identifying appropriate plane of dissection and can minimize the risk of inadvertent injury to parathyroid glands and RLN[8,910]. The present study was conducted to test this proposed benefits of microscopic surgery in thyroidectomy.

In present study, the mean age was 36.4±13.4 years. A similar mean age of 36.9±12.2 years has been described by Khan et al.[11] (2016) among patients presenting with nodular thyroid enlargement at Pakistan Institute of Medical Sciences Islamabad. Ahsan et al.[12] (2013) reported similar mean age of 35±2.2 years among patients presenting with goiter at Jinnah Postgraduate Medical Centre, Karachi. In another local study, Anwar et al.[13] (2012) reported comparable mean age of 37±12.5 years among such patients at Hayatabad Medical Complex, Peshawar. Jena et al.[14] (2015) reported similar mean age of 36.8±13.3 years in Indian such patients while Hossain et al.[15] (2014) and Rashid et al.[16] (2016) reported it to be 36.5±12.3 years and 38.9±15.3 years respectively in Bangladesh. Jat et al.[17] (2019) reported similar mean age of 35±7.9 years among Saudi such patients while Asmelash et al.[18] (2019) reported it to be 38.1±13.9 years in Ethiopia.

We witnessed that majority (57.6%) of the patients were aged between 26-50 years, followed by 25 (27.2%) patients aged ≤25 years and 14 (15.2%) patients aged >50 years. Anwar et al.[13] (2012) in a similar local study at Hayatabad Medical Complex, Peshawar observed similar frequency of ≤25 years, 26-50 years and >50 years age groups among such patients and reported it to be 36.2%, 52.0% and 11.8% respectively. A comparableDdistribution

of ≤25 yearsD(22.8%),U26-50 years (70.2%) and >50 years (7.0%) has also been reported by Saqlain et al.[19] (2018) among patients presenting with MNGs at various hospitals of Sindh. Analogous frequency of 22.0%, 64.0% and 14.0% for ≤25 years, 26-50 years, >50 years age groups has been described by Shrestha et al.[20] (2014) in IndianSsuch patients while HossainKet al.[15] (2014) statedFthese frequencies toKbe 24.0%, 66.0% andS10.0% respectively inDBangladesh.

We observed that there were 18 (19.6%) male and 74 (80.4%) female patients with nodular thyroid enlargement with a male to female ratio of 1:4.1. OurGobservation is in line with that of Ahsan et al.[12] (2013) who also observed similar female predominance among such patients and reported a male to female ratio of 1:4.1 at Jinnah Postgraduate Medical Centre, Karachi. Similar female predominanceFwith male to female ratio of 1:4 has also been reported by Ahmad et al.[21] (2013) at Madina Teaching Hospital, Faisalabad. In various other local studies Anwar et al.[13] (1:3.5), Ullah et al.[22] (1:3) and Khan et al.[11] (1:3) also reported similar female predominance among such patients. Our observation is also in lineWwith that of Gautam et al.[23] (2017), Jena et al.[14] (2015) and Krishna et al.[24] (2019) who also reported similar female predominance among Indian such patients with male to female ratio of 1:4, 1:3.8 and 1:3.4 respectively. A somewhat greater femaleFpredominance with male to female ratio of 1:6.6 has been described by Rashid et al.[16] (2016) in Bangladeshi such patients.

In the present study we observed that the frequency of hypocalcemia (4.3% vs. 15.2%; p-value=0.079) and RLN injury (2.2% vs. 6.5%; p-value=0.307) was insignificantly lower in the microscopic group as compared to conventional thyroidectomy. Thus microscopic thyroidectomy was superior to conventional practice and avoided injury to vital structures i.e. parathyroid and recurrent laryngeal nerve. Our observation is in line with that of another similar study where Testini et al.[8] (2003) also reported similar yet insignificant difference in the frequency of hypocalcemia (4.3% vs. 14.0%; p-value >0.05) and RLN injury (0.0% vs. 4.0%; p-value >0.05) with versus without the use of microscope. Seven et al.[9] (2005) also reported similar decreased frequency of hypocalcemia (1.7% vs. 12.5%; p-value=0.032) and RLN injury (1.7% vs. 5.0%; p-value >0.05) with the use of loop magnification during thyroidectomy. Similar variance in the incidence of RLN injury (0.83% vs. 1.7%; p-value >0.05) has also been stated by Saber et al.[10] in 2011.

The current trial is first of its nature in Pakistani population and adds to the limited already published international research evidence on the topic. In the present study we found that microscopic dissection during total thyroidectomy minimized the risk of iatrogenic injury to parathyroids and recurrent laryngeal nerve which is desirable in such patients and therefore advocate preferred use of microscopic thyroidectomy in future endocrine surgery.

CONCLUSION

In the current study, the frequency of post-operative hypoparathyroidism and recurrent laryngeal nerve injury was lower in patients undergoing microscopic thyroidectomy which is much desired and appreciated in such patients. It is therefore advisable that microscopic thyroidectomy should be preferred in future surgical practice provided the necessary hardware and skills are available.

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