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Original Article

Parathyroid Gland Conservation in Thyroidectomy: Implications for Postoperative Quality of Life

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ABSTRACT

Background: Thyroidectomy was once banned in Europe and is now one of the most skilled procedures. There are 4 parathyroids present in close association of thyroid gland helping in calcium hemostasis in the body. Postoperative hypothyroidism results from reduced function of parathyroid parenchyma resulting in delayed or transient hypocalcemia making subject dependent on calcium supplements.
Aim: The present study was aimed to assess the role of parathyroid conservation in thyroidectomy posing the implications for postoperative quality of life.
Methods: The present study assessed 100 subjects that underwent thyroidectomy at the Institute within the defined study period. All included subjects were assessed and monitored for hypocalcemia and its effect on postoperative quality of life in these subjects. The subjects were asked to start with preoperative oral calcium supplementation in subjects that had <8mg/dl serum calcium levels.
Results: The study results showed that among 100 subjects assessed in the study, 42 subjects reported to gave consistent normocalcemia. It was also seen that 10 of the subjects had severe hypocalcemia after the surgery. In 56 study subjects, postoperative calcium supplementation was needed.
Conclusion: The present study concludes that saving and visualization of parathyroid gland along with its vascular supply by vigorous capsular dissection is the most challenging and still effective measure for prevention of postoperative hypocalcemia following the thyroid surgery.

Keywords*: Calcium, Hypocalcemia, Iatrogenic Injury, Parathyroid, Thyroidectomy.*

INTRODUCTION

The parathyroid glands are the endocrine glands that are present in close proximity to the thyroid glands in majority of the population. Parathyroid glands are normally four in number, however, supernumerary parathyroids have been identified in nearly 13% of the autoperativesies. Normal parathyroid glands are nearly 5-6mm as seen in greatest dimensions having weight of nearly 15-35 mg and can be identified with their orange -tan color surrounded by yellow fatty tissue envelop. These glands are usually confused with fat globules or central compartment lymph nodes. Superior parathyroid glands are usually derivatives of fourth pharyngeal pouch and are typically located near posterolateral aspect of superior thyroid pole, 1cm superior to junction of inferior thyroid artery and RLN (recurrent laryngeal nerve).[1]

Inferior thyroid glands are the derivatives of third pharyngeal pouch and are typically situated near the inferior poles of the thyroid glands, within 1-2 cm of the insertion of the inferior thyroid artery to the inferior pole. They are classically present superficial to the plane of RLN. Major blood supply is from inferior thyroid artery. Recent literature data following AACE (American association of clinical Endocrinologist) reported management and definitions for post-surgical hypocalcemia.[2]

Concerning post-surgical hypocalcemia a total serum calcium of less than 8.5 mg/dl (2.125 mmol/L) or ionized calcium less than 1.15 mmol/L were considered as cut off levels. Following National Library of Medicine; transient postoperative hypocalcemia occurs in 1 - 68% cases, permanent 0-13% cases, within 24 hrs 21.4%, on post-operative day1 29%, six months post-surgery 3.6%, post-operative hypocalcemia results from a reduction of functioning parathyroid parenchyma which could be secondary to intraoperative damages caused by inadvertent parathyroid excision, gland devascularization, thermal injuries, or mechanical injuries.[3]

There are various studies that have reported various ways for prevention of parathyroid injury during thyroid surgery. One approach has suggested to assess any existing relationship in post-operative hypothyroidism and number of parathyroids identified intra operative. Identifying the parathyroid glands have led to 90% hypocalcemia and 10% permanent hypocalcemia. Other methods being preservation of vascularity, subcapsular saline Injection, intra operative identification of glands with auto fluorescence and indocyanine green angiography, and surgical mapping for parathyroid glands. Postoperative hypocalcemia result in major impact on the quality of life and need admission in hospital in severe cases.[4] Hence, the study was aimed to assess the role of parathyroid conservation in thyroidectomy posing the implications for postoperative quality of life.

MATERIALS AND METHODS

The present observational prospective study was aimed to assess the role of parathyroid conservation in thyroidectomy posing the implications for postoperative quality of life. The study was done at Department of Otorhinolaryngology, Akash Institute of Medical Sciences & Research Centre, Devanahalli, Banglore, Karnataka after the clearance was taken by the concerned Institutional Ethical committee. The study subjects were from the Department of ear, nose, and throat of the Institute. Verbal and written informed consent were taken from all the subjects before study participation.

The present study assessed 100 subjects that underwent thyroidectomy at the Institute within the defined study period. The study assessed all the subjects that presented with thyroid swelling and were indicated for the surgery within the defined study period. Detailed history was recorded from all the subjects followed by comprehensive clinical assessment and preoperative necessary investigations to confirm their eligibility.

The inclusion criteria for the study were all the subjects with thyroid swelling that had indication of thyroidectomy and were willing to participate in the study. The exclusion criteria for the study were subjects that had systemic diseases resulting in deranged hemostasis of calcium, subjects with pre-operative parathyroid dysfunction, and subjects that did not give consent for study participation.

After final inclusion, surgery was done in all the subjects where surgical technique utilized capsular dissection of the thyroid gland with anatomical mapping of the parathyroid glands. Special care was taken for preservation and identification of the inferior thyroid artery and its different branches which then followed close-to-gland ligation of the inferior thyroid artery, preserving a distal branch if it supplied the thyroid. After completion of the surgery, subjects were recalled and followed.

The data gathered were analyzed statistically using the chi-square test, Fisher's exact test, Mann Whitney U test, and SPSS (Statistical Package for the Social Sciences) software version 24.0 (IBM Corp., Armonk. NY, USA) using ANOVA and student's t-test. The significance level was considered at a p-value of <0.05.

RESULTS

The present observational prospective study was aimed to assess the role of parathyroid conservation in thyroidectomy posing the implications for postoperative quality of life. The present study assessed 100 subjects that underwent thyroidectomy at the Institute within the defined study period. All included subjects were assessed and monitored for hypocalcemia and its effect on postoperative quality of life in these subjects. For identification of landmarks for left and right superior parathyroid glands, Tubercle of zuckerkandl was seen in 4 subjects at left and 2 subjects on the right side, Cricothyroid junction was seen in 6 subjects each on right and left side, RLN and inferior thyroid artery (ITA) was seen in 12 and 22 subjects on left and right side respectively, and RLN was seen in 18 and 36 subjects on right and eft side (Table 1).

Table 1: Identification of landmarks for left and right superior parathyroid glands

S. No	Landmarks	Left	Right
1.	Tubercle of zuckerkandl	4	2
2.	Cricothyroid junction	6	6
3.	RLN and ITA	12	22
4.	RLN	18	36
5.	Total	40	66

It was seen that for number of cases that underwent various surgeries, total thyroidectomy with neck dissection was done in 12 study subjects. The most commonly performed surgery type was hemithyroidectomy which was done in 64 study subjects followed by total thyroidectomy which was performed in 24 study subjects respectively (Table 2).

Table 2: Number of cases that underwent various surgeries

S. No	Surgery type	Number (n)
1.	**Total thyroidectomy with neck dissection**	12
2.	**Total thyroidectomy**	24
3.	**Hemithyroidectomy**	64
4.	**Total**	100

The study results showed that concerning identification landmarks for left and right inferior parathyroid glands, Tubercle of zuckerkandl was seen 2 subjects each from left and right side, lower pole was seen in 14 subjects on left side and 22 subjects on the right side, recurrent laryngeal nerve and inferior thyroid artery was seen in 8 and 14 subjects on the left and right side, and recurrent laryngeal nerve was seen in 6 subjects on left side and 6 subjects on right side each (Table 3).

Table 3: Identification of landmarks for left and right inferior parathyroid glands

S. No	Landmarks	Left	Right
1.	**Tubercle of zuckerkandl**	2	2
2.	**Lower pole**	14	22
3.	**RLN and ITA**	8	14
4.	**RLN**	6	6
5.	**Total**	30	44

Concerning the assessment of serum calcium levels preoperatively and postoperatively in study subjects, <7mg/dl was seen in no study subject preoperatively and in 20, 24, 16, and 10 subjects on postoperative day 1, 4, 14, and 28 respectively. Serum calcium level of 7-8mg/dl was seen in 32 subjects preoperatively and in 28, 28, 24, and 36 subjects on postoperative day 1, 4, 14, and 28 respectively. Level of 8-8.5 mg/dl was seen in 56 subjects preoperatively and in 40, 40, 52, and 42 subjects on postoperative day 1, 4, 14, and 28 respectively. Serum calcium levels of >8.5mg/dl were seen in 12 subjects preoperatively and in 12, 8, 8, and 12 subjects on postoperative day 1, 4, 14, and 28 respectively (Table 4).

Table 4: Serum calcium levels preoperatively and postoperatively in study subjects

S. No	Serum calcium levels	Preoperative	Postoperative Day 1	Postoperative Day 4	Postoperative Day 14	Postoperative Day 28
1.	**<7mg/dl**	0	20	24	16	10
2.	**7-8mg/dl**	32	28	28	24	36
3.	**8-8.5mg/dl**	56	40	40	52	42
4.	**>8.5mg/dl**	12	12	8	8	12

DISCUSSION

The present study assessed 100 subjects that underwent thyroidectomy at the Institute within the defined study period. All included subjects were assessed and monitored for hypocalcemia and its effect on postoperative quality of life in these subjects. For identification of landmarks for left and right superior parathyroid glands, Tubercle of zuckerkandl was seen in 4 subjects at left and 2 subjects on the right side, Cricothyroid junction was seen in 6 subjects each on right and left side, RLN and inferior thyroid artery (ITA) was seen in 12 and 22 subjects on left and right side respectively, and RLN was seen in 18 and 36 subjects on right and eft side. These results were consistent with the findings of Deka A et al[5] in 2025 and El-Shinawi et al[6] in 2014 where landmarks for left and right superior parathyroid glands similar to the present study were also identified by the authors in their studies.

The study results showed that for number of cases that underwent various surgeries, total thyroidectomy with neck dissection was done in 12 study subjects. The most commonly performed surgery type was hemithyroidectomy which was done in 64 study subjects followed by total thyroidectomy which was performed in 24 study subjects respectively. These findings were in agreement with the results of Gac EP et al[7] in 2007 and Thomusch O et al[8] in 2003 where surgery proportion for various surgical procedures reported by the authors were comparable to the results of the present study.

It was seen that concerning identification landmarks for left and right inferior parathyroid glands, Tubercle of zuckerkandl was seen 2 subjects each from left and right side, lower pole was seen in 14 subjects on left side and 22 subjects on the right side, recurrent laryngeal nerve and inferior thyroid artery was seen in 8 and 14 subjects on the left and right side, and recurrent laryngeal nerve was seen in 6 subjects on left side and 6 subjects on right side each. These

results were in line with the findings of Park I et al[9] in 2016 and Chang YK et al[10] in 2017 where landmarks for left and right inferior parathyroid glands comparable to the present study were also reported by the authors.

On assessing the serum calcium levels preoperatively and postoperatively in study subjects, <7mg/dl was seen in no study subject preoperatively and in 20, 24, 16, and 10 subjects on postoperative day 1, 4, 14, and 28 respectively. Serum calcium level of 7-8mg/dl was seen in 32 subjects preoperatively and in 28, 28, 24, and 36 subjects on postoperative day 1, 4, 14, and 28 respectively. Level of 8-8.5 mg/dl was seen in 56 subjects preoperatively and in 40, 40, 52, and 42 subjects on postoperative day 1, 4, 14, and 28 respectively. Serum calcium levels of >8.5mg/dl were seen in 12 subjects preoperatively and in 12, 8, 8, and 12 subjects on postoperative day 1, 4, 14, and 28 respectively. These findings correlated with the results of Palloti F et al[11] in 2003 and Roh JL et al[12] in 2009 where results reported by the authors for serum calcium levels preoperatively and postoperatively were similar to the results of the present study.

CONCLUSION

The present study, within its limitations, concludes that saving and visualization of parathyroid gland along with its vascular supply by vigorous capsular dissection is the most challenging and still effective measure for prevention of postoperative hypocalcemia following the thyroid surgery. However, further studies with larger sample size and longer monitoring are needed to reach a definitive conclusion.

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