Original Article

A Study on Surgical Anatomy of Middle Thyroid Vein

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ABSTRACT

Background and Aim: Understanding the anatomic variability of thyroid vessels and laryngeal nerves is of vital importance to minimize the occurrence of eventual complications in thyroid surgery. The purpose of this prospective study was to determine the prevalence of Middle Thyroid Vein together with its macroscopic characteristics and to evaluate possible statistical correlations between the vein presence and some clinical and pathological variables.

Materials and Methods: This study was performed prospectively with the goal of evaluating the prevalence of Middle Thyroid Vein in 200 patients who underwent thyroidectomy in the Department of General Surgery, Government General Hospital, Kakinada, Andhra Pradesh, India.

Results: Over all middle thyroid vein identified in 93 of 200 patients (46.5%). Highest prevalence in age group between 21-30 years 34(47.8%). In benign Thyroid diseases, middle thyroid vein is identified in 79 cases in total 152 patients. In malignant thyroid diseases middle thyroid vein is identified in 14 cases in total 48 patients.

Conclusion: Total of 200 patients were included in this study, overall prevalence of Middle Thyroid Vein 46.5% in 200 patients. Middle Thyroid Vein frequently identified between 21 to 30 years of age.

Keywords: Middle thyroid vein, thyroid gland, venous drainage

INTRODUCTION

A thorough data of the essential embryology, anatomy and pathological alterations is needed for a surgeon who plans for thyroid surgery. This is often needed for getting good results following surgery and scale back post-operative morbidity. [1] The main points of thyroid the technique of Thyroid surgery as well as its surgical anatomy were established by nice works of Kocher, Billrath, Lahey, Crile, etc., have been antecedently revealed. [2] In spite of large volumes of literature on embryology, anatomy, and pathology of the thyroid, there is limited literature on the practical aspects of surgical anatomy of thyroid, and it is limited to few papers.[3-5] Surgeons must use ultrasonography to assess the surgical anatomy of the thyroid glands particularly thyroid veins, due to anatomical variations of thyroid vessels, which lead to extensive hemorrhages caused by vascular lesions during thyroidectomy. [6]

The Thyroid gland drains into 3 main veins, the three main veins are the superior, middle and inferior thyroid veins, and each vein drains its respective region of the thyroid. The inferior thyroid vein, communicates with

the middle and superior thyroid veins, arises in the various plexus on the thyroid gland. The inferior thyroid vein drains into the brachiocephalic veins, whereas superior and middle thyroid veins drain into the Internal jugular vein [IJV].[7,8] The middle thyroid vein (MTV) drains into the internal jugular vein and is described as short and wick vessel.[9] The middle thyroid veins have a small internal diameter (average of 2.0 mm).[10] The middle thyroid vein is at risk during thyroidectomy, during surgery it can be teared from the IJV which can lead to a difficult hemorrhage. [3]

The Purpose of study was to determine prevalence of middle thyroid vein (MTV) together with its macroscopic characteristics. To evaluate statistical correlation between the vein presence and some clinical pathological variables. Understanding the anatomic variability of thyroid vessels and laryngeal nerves is of vital importance to minimize the occurrence of complication in thyroid surgery.

MATERIALS AND METHODS

This study was performed prospectively with the goal of evaluating the prevalence of middle thyroid vein in 200 patients who underwent thyroidectomy in the Department of General Surgery, Govt. General Hospital, Kakinada, and Andhra Pradesh, India. The present descriptive study, prospectively performed in a relatively small series of patients with different thyroid diseases, produced homogeneous results focused on the specific regional, of southern India.

A total of 29 men, 171 women aged between 10-72 years were included in the study. Of these surgical procedures 117(58.5%) were Hemithyroidectomies, 37(18.5 %) were Subtotal thyroidectomies, 46 (23%) were total thyroidectomies.

Exclusion criteria were history of previous, cervical surgeries and nonthyroid surgeries or advanced thyroid malignancy. On the basis these criteria, 4 patients were consequently excluded from the study.

If the patient had to be submitted to a total thyroidectomy each middle thyroid vein, together with its correspondent branches was considered as a separate unit. The frequency of middle thyroid vein was expressed as the no. of half thyroid gland (lobe) having a specific/ total number of Middle Thyroid Vein.

Dual or more middle thyroid vein were counted as two or difference vessels only when each of their origins was clearly identified. The absence of middle thyroid vein was computed with a frequency value equal to zero. The mid lines of the thyroid gland were defined by the upper and lower a border of the isthmus. Super and inferior borders are defined by superior thyroid artery and lower pole of the thyroid lobe respectively. Participants provided Informed consent.

Ethics Approval:

This study was reviewed and approved by Institute Ethics Committee, Gandhi Medical College, Secunderabad.

Operative technique

Procedure started with curvilinear collar type incision made two finger breadth above the sternal notch. The incision was carried through platysma, superior and inferior platysma flaps were raised. Once the strap muscles have been retracted or divided. Dissection on the lateral border of the thyroid gland was performed to preliminarily mobilize the lobe.

Technique of visualization

To visualize the MTV, the lateral space between the thyroid gland and the carotid sheath, which is generally only filled with areolar tissue, is opened down to the pre vertebral fascia. The first major vein to be encountered at this stage is the MTV and, as next step, the entire thyroid lobe is mobilized and inspected carefully.

An accurate dissection and positive identification of the MTV was favored by a gentle retraction and elevation of the thyroid gland in a medial direction, with the help of a gauze so as not injure the gland, together with the use of lateral counter traction on the sternothyroid muscle and, to some extent, on the carotid sheath and the sternocleidomastoid muscle.

This maneuver provides an excellent exposure of the MTV, the integrity of which also might be reached through the adoption of a meticulous technique. Dedicated tiny spatulas and debrider-aspirator concur to provide a complete and adequate exposure of the MTV, with vessels and their relative branches, which may be meticulously and individually dissected both laterally and medially.

In some situations, the strap muscles were sectioned to improved access to the lateral surface of the thyroid lobe, especially in large goiters.

STATISTICAL ANALYSIS

All study details were recorded in a proforma and data were entered into Microsoft excel spread sheets.

Data is expressed as mean±standard deviation for continuous variables and as frequency (number (%) for categorical variables. All statistical analysis were performed using Microsoft excel spreadsheets (Microsoft, Redmond, WA USA).

RESULTS

Table 1: Complete data and follow up of patients

Parameter		Value	Percentage
Age		10-72	
Woman		171	85.5
Men		29	14.5
Pathology	Benign nodule	149	74.5
	Toxic nodule	3	0.15
	Carcinoma	48	24.35
Procedure	Hemithyroidectomy	117	58.5
	Subtotal thyroidectomy	37	18.5
	Total thyroidectomy	46	23

Table 2: Age wise distribution of MTV

Age (Years)	Total no of Cases	Presence of MTV
10 - 20	25	8 (8.6%)
21 - 30	71	41 (44.1%)
31 - 40	43	19 (20.4%)
41 - 50	39	15 (16.1%)
51 - 60	16	8 (8.6%)
61 - 70	5	1 (1.1%)
70 - 80	2	1 (1.1%)

TV : Middle thyroid vein *p=0.2 (Not significant statistically)*

Table 3: Anatomical distribution of MTV

Side	Right	Left	Both
Presence of			
MTV	57 (61.3%)	35(37.6%)	01 (1.1%)

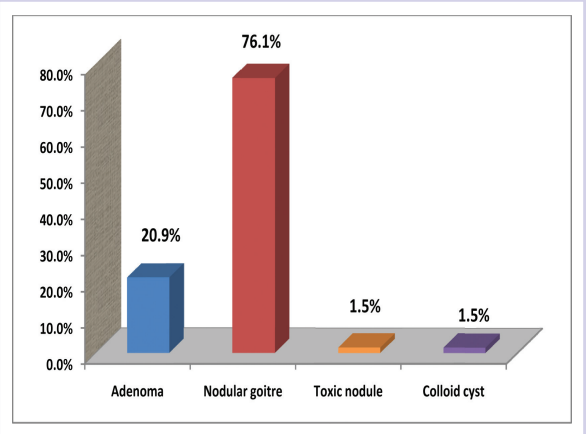
Table 4: Procedure wise distribution of MTV

Procedure	Total no of cases	Presence of MTV N (%)
Right hemi thyroidectomy	69	36(38.7%)
Left hemi thyroidectomy	48	23(24.7%)
Subtotal thyroidectomy	37	19(20.4%)
Total thyroidectomy	46	15 (16.1%)

Table 5: Disease wise distribution of MTV

Disease	Total	Presence of MTV N (%)
Benign diseases	152	67 (44.07%)
Malignant	48	14 (29.78%)

MTV: Middle thyroid vein *p=0.06 (Not significant statistically)*



Graph 1: Presence of MTV in benign disease

Table 1 shows complete data and follow up of patients. A total subject in the study was 200 patients aged between 10-72 years. Total female patients 171(85.5%) and male subjects 29(14.5%). The patients with Benign nodule 149 (74.5%), Toxic Nodule 3(0.15%) and carcinoma 48(24.35%). The patients underwent thyroidectomy 117(58.5%), Sub Total Thyroidectomy 37(18.5%) and Total Thyroidectomy46(23%).

Table 2 shows Age wise Distribution of middle thyroid vein Highest prevalence was seen in the age group between 21-30 years 41 (44%).

Table 3 shows Anatomical distribution of Middle Thyroid vein. In 57(61.3%) cases Middle Thyroid vein is present on Right side. In 35(37.6%) cases middle thyroid vein is presented on left side. In 01(1.1%) case Middle Thyroid vein is present on both sides.

Table 4 shows procedure wise distribution of Middle Thyroid vein. In patients who underwent Right Hemi thyroidectomy middle thyroid vein is identified in 36(38.7%) cases, in left Hemithyroidectomy Middle Thyroid vein is identified in 23(24.7%) cases, in Subtotal thyroidectomy middle thyroid vein is identified in 19(20.4%) cases, and in Total thyroidectomy. Middle Thyroid vein is identified in 15 (16.1%) cases.

Table 5 shows Disease wise distribution of middle thyroid vein. In benign thyroid diseases middle thyroid vein is identified in 67 cases in total 152 patients. In malignant thyroid diseases Middle Thyroid vein is identified in 14 cases in total 48 patients.

Graph 1 shows distribution of Middle Thyroid vein in benign Thyroid diseases. In Adenoma Middle Thyroid Vein is present in 14 cases. In Nodular Goiter Middle Thyroid Vein is present in 51 cases. In Toxic Nodule Middle Thyroid Vein is present in 1 case and in Colloid cyst Middle Thyroid Vein is present in 1 case.

Over all Middle Thyroid Vein was identified in 93 of 200 patients (46.5%). This includes 13 men (44.8%) and 80 women (46.7%). Considering each lobe as a unit Middle Thyroid Vein was present in 90 of 283 lobes 32 %. Middle Thyroid Vein was found in 57 of 149 lobes (38.2%) on the right side, while it was present in 35 of 135 lobes (25.9%) on the left side. Middle vein presence on both sides was seen in 1 (1.3%) case (Table 3).

The presence of bilateral symmetry was seen in 1 case. None of them had presence of Middle Thyroid Vein branches. Territory of Middle Thyroid Vein originating from the anterior thyroid face was seen in 79(84.3%). Territory of Middle Thyroid Vein originating from posterior and lateral was seen in 14 (15.05%). The presence of internal jugular vein entrance Medial anterior was seen in 81(87.09%) while Internal jugular vein entrance Medial posterior was seen in 12 (12.9%). Crossing anterior to the Internal Carotid artery 93(100%). Prevalence of Middle Thyroid Vein is higher in Benign diseases 67(44.07%), Nodular goiter 51(76.1%). Double Middle Thyroid Vein is seen-1.

Post Operative Follow up

One patient developed hematoma that was explored and was identified to have bleeding from the cut ends of the strap muscles and eventually ligated. Two patients developed stridor immediately after surgery and tracheotomy was done in both the cases. Two patients developed stitch granuloma who were managed conservatively. Two patients had temporary hypocalcemia serum calcium less than 1.9 mol/l which was treated by calcium supplementation. One patient died of stridor on the day of surgery.

DISCUSSION

In Thyroid surgeries the mortality rates are decreased that varies little from the general anesthesia alone. Surgeons must have a thorough knowledge of the anatomy of head and neck and pathophysiology of thyroid disorders to obtain good results in thyroid surgery.[11] Surgeons must use a cautious, unrushed, careful, and accurate operative technique and also must be experienced in the pre-operative and post operative care of patients. To perform thyroid surgery a careful and systematic approach is obligatory. [12-14]

In applications of thyroid, Parathyroid and laryngeal surgery, in the transpositions of myocutaneous flaps for reconstructions.[10] and particularly in tracheotomies [16-18] a detailed awareness of the anatomy of the thyroid veins is important. [15] The middle thyroid vein anatomy is important because it is tiny narrow vessel, leaving the middle of gland and directly coursing laterally to pass in front of or behind the carotid artery and enter the internal jugular vein, it is first vessel encountered in thyroid-ectomy and merits careful ligation.[19]

Another confront in thyroid surgery is Protection of vascularized and working Para Thyroid glands. During central compartment neck dissection done for differentiated thyroid cancer or thyroidectomy in difficult goiters Inferior PT glands are particularly injured. In such a scenario, prophylactic auto transplantation of the inferior PT is an option proposed by few.[20, 21] Careful pick up of PT and ligation of discrete blood vessels close to the thyroid gland [22, 23] is obligatory for protection and separation of PT from the per thyroidal lymph node, thymus, far lobules, and ectopic thyroid tissue.

Cervical strap muscles have a task in voice pitch management and swallowing functions[24-27]. In the present study one patient developed hematoma, due to bleeding from the cut ends of the strap muscles to prevent this lateral approach is done through the anatomical window between the upper part of sternocleidomastoid and superior belly of omohyoid which necessitate only opening of fascia (investing layer of deep cervical fascia) to preserve the superior thyroid vessels, the middle thyroid vein and easily start the lateral part of dissection of the thyroid lobe, to make easy delivery from underneath the cervical strap muscles to the midline would without their division or even excessive retraction.[28-29]

The present study focused on the anatomy of middle thyroid vein, which is an undoubtedly relevant issue with in thyroid surgery, despite having been generally ignored in medical literature. This study was done to investigate, and analyze the frequency numerical variation, and anatomical geometric characteristics of middle thyroid vein in patients with thyroid disorders (total of 283 of thyroid lobes). This data are intended to support early studies that indicated the rarity of the vein. In the present study middle thyroid vein were found in 46.5% of patients, 32% of lobes dissected. The prevalence of middle thyroid vein (middle thyroid vein/ lobes of thyroid =93/ 283=32.1%). This is in agreement with previous reports which showed the prevalence to be 38%.[20] Territory of

middle thyroid vein origin anterior thyroid surface was found to be 84.3%. Middle thyroid vein enters on the medial and anterior aspect of internal jugular vein in 87.09% cases, crossing anterior to the internal carotid artery in all the cases. This is comparable to a previous study.

Our study showed none of the 93 visualized middle thyroid vein showed. Presence of anastamosis with other veins. None of the middle thyroid vein visualized has accompanying artery. This is in agreement to a previous study. Middle thyroid vein was frequently observed in benign thyroid diseases namely nodular goitre where hyper functioning, large goiters have highest prevalence. This is in agreement to a previous study.

CONCLUSION

Over all prevalence of middle thyroid vein 46.5% in 200 patients. Over all prevalence of middle thyroid vein 32% in 283 lobes. A better understanding of the anatomic variability in middle thyroid vein may be useful not only to minimize the risk of bleeding, but it also can help to perform a more accurate dissection with the goal of preserving the laryngeal nerve and parathyroid glands, especially because of its location and relationships with other adjacent structures.

CONFLICT OF INTEREST:

The authors declared no conflict of interest.

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