

Study of Inferior Thyroid Artery and its Relation to the Sympathetic Chain in Full Term Fetuses

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ABSTRACT

Introduction: Familial dysautonomia and Sudden Infant Death Syndrome (SIDS) are amongst the most frequently encountered dysautonomias. Sympathetic cardiac dysfunction is indicated by prolonged corrected QT interval. The therapy for long QT includes left cervical sympathectomy and administration of beta adrenergic receptor antagonists. Also, cervical and cervicothoracic sympathectomies are emerging as choices of treatment for epilepsies, Raynauds syndrome and vascular disorders of the upper extremities. There have been few studies in fetuses, inspite of the various structural anomalies encountered in the vicinity of the thyroid gland and this warrants the need of a fetal study.

Aim: The present work was undertaken to study the anatomy of the thyroid gland and its neighboring structures in fetuses with a special focus on the relation of the sympathetic chain and inferior thyroid artery.

Materials and Methods: A total of 54 still born fetuses procured from the Department of Obstetrics and Gynecology, SSSMCRI and KGH, Vishakapatnam after getting informed consent from the parents and getting the approval from the ethical committee. An observational

(cross sectional) study was conducted over a period of 3 years from 2013 to 2015. All the fetuses included in this study were over 36 weeks. Fetuses with neural tube defects were excluded from this study. The fetuses were embalmed by injecting 10% formalin into the serous cavities of the abdomen, cranial cavities through the orbit and into the muscles and limbs.

Result: Of the 54 fetuses studied, the inferior thyroid artery had a course behind the sympathetic chain on both the sides in 24 (44%) and anterior to it on both sides in 10 (18.5 %) fetuses. The inferior thyroid artery was anterior to it on the right and posterior to it on the left in 5 (9.25%) cases and anterior to it on the left and posterior to it on the right in 13 (24%). The inferior thyroid artery passed through the sympathetic chain on the left side in 3 (5.5%) cases. In one fetus, the inferior thyroid artery was lying parallel to the sympathetic chain. The artery was absent on the left side in 2 (3.7%) and on the right in 1 (1.8 %) fetus.

Conclusion: Knowledge of the varied relations of the inferior thyroid artery to the sympathetic chain encountered study may act as a cornerstone for safely performing cervical sympathectomies in infants if indicated.

Keywords: Cervical sympathectomy, Middle cervical ganglion (MCG), Sudden infant death syndrome (SIDS)

INTRODUCTION

Impaired autonomic interactions are said to cause dysautonomias (Garson et al.,) [1] of which the Familial type and Sudden Infant Death Syndrome (SIDS) are most commonly encountered. Infants with familial dysautonomia have an increased risk of sudden death. In some patients with familial dysautonomia, sympathetic cardiac dysfunction is indicated by prolonged corrected QT interval (Hilz et al.,) [2]. The therapy for long QT includes Left cervical sympathectomy and administration of Beta adrenergic receptor antagonists (Keating & Sanguinetti) [3]. Also, cervical and cervicothoracic sympathectomies are emerging as choices of treatment for

epilepsies, Raynauds syndrome and vascular disorders of the upper extremities. The sympathetic trunk is also more vulnerable to damage during anterior lower cervical spine procedures Ebraheim et al., [4]. Hence, a study its course and relations is warranted.

In the present study, special attention is given to the relation of the sympathetic chain with the inferior thyroid artery, the knowledge of which is essential during thyroid surgeries and cervical sympathectomy [5].

The inferior thyroid artery is the largest branch of the thyrocervical trunk. It usually ascends upwards along the medial border of the scalenus anterior, turns medially just below the transverse

process of 6th cervical vertebra or opposite the lower border of cricoid cartilage and passes anterior to the vertebral vessels but behind the carotid sheath and the sympathetic trunk to lie behind the lower pole of the thyroid gland.

The artery may also present variable relations with the sympathetic trunk. Cervical part of the sympathetic chain is very closely related to the inferior thyroid artery. The trunk may be behind or in front of the artery, may be split by the artery or cardiac branches may cross anterior to the artery while the trunk itself may pass behind.

AIM

The present work has been undertaken to study the anatomy of the thyroid glands and its neighboring structures in fetuses with a special focus on the relation of the sympathetic chain and inferior thyroid artery in 54 still born full term fetuses. The existing literatures have been thoroughly reviewed and observations noted.

MATERIALS AND METHODS

A total of 54 still born fetuses procured from the Department of Obstetrics and Gynecology, SSSMCRI and KGH, Vishakapatnam after getting informed consent from the parents and getting the approval from the ethical committee. An observational (cross sectional) study was conducted over a period of 3 years from 2013 to 2015. All the fetuses included in this study were over 36 weeks. Fetuses with neural tube defects were excluded from this study. The fetuses were embalmed by injecting 10% formalin into the serous cavities of the abdomen, cranial cavities through the orbit and into the muscles and limbs.

A vertical midline incision extending from the symphysis menti to the suprasternal notch and a horizontal incision along the base of the mandible was made. The skin and platysma muscles were reflected laterally on both side and the infrahyoid group of muscles was identified. The sternothyroid and sternohyoids were then reflected thereby exposing pretracheal lamina of deep fascia. The inferior thyroid arteries were traced to the lower pole of the gland.

RESULT

The inferior thyroid artery invariably arose from the thyrocervical trunk and coursed in front of the scalenus anterior muscle, vertebral vessels and behind the carotid sheath. It usually passed behind the sympathetic chain, particularly the middle cervical ganglion which was on the inferior thyroid artery. The artery was traced in the tracheo-oesophageal groove to reach the lower end of the gland.

Inferior thyroid artery in majority of the fetuses was found posterior [Table/Fig-1] to the sympathetic chain rather than anterior to it [Table/Fig-2]. Inferior thyroid artery, a branch of thyrocervical trunk was observed in 51 fetuses (94.4%). Inferior thyroid artery was absent in 3 cases [Table/Fig-3]. Thyroid ima artery was not found in any of fetuses dissected. The recurrent



[Table/Fig-1]: Inferior thyroid. A lying posterior to the sympathetic chain (Right Side) [Table/Fig-2]: Inferior thyroid artery lying anterior to the sympathetic chain (Left Side)

laryngeal nerve, inferior thyroid artery and sympathetic chain in one case were lying parallel to each other [Table/Fig-4]. In 3 cases, the inferior thyroid artery passed through the sympathetic chain. The relationship of the inferior thyroid artery to the sympathetic chain was not constant and bound for variations [Table/Fig-5].



[Table/Fig-3]: Absence of inferior thyroid artery on the left side. [Table/Fig-4]: RLN, inferior thyroid. A and sympathetic chain lying parallel to each other (L.Side).

Relation of Inferior Thyroid artery to sympathetic chain	No. of fetuses	Percentage (%)
Posterior on both sides	24	44
Anterior on both sides	10	18.5
Anterior on the right side & Posterior on the left side	5	9.25
Anterior on the Left side & Posterior on the Right side	13	24

[Table/Fig-5]: Relation of inferior thyroid artery to sympathetic chain in full term fetuses.

DISCUSSION

Variations in the origin and course of the inferior thyroid artery have been previously reported in a number of cases. Achuri V et al., [6] reported the absence of inferior thyroid artery in 1% cases and a thyroid artery arising from the common carotid artery in 2% of the cases and also reported anomalous vessel which took origin from carotid bifurcation and supplied either right or left lobe of the thyroid gland. Bohutova et al., [7] gave a case report on inferior thyroid artery taking origin from the left vertebral artery. Jevlev et al., [8] and Sherman H et al., [9] reported the absence of right and left. inferior thyroid arteries respectively. Vijaybhaskar et al., [10] reported bilateral absence of inferior thyroid artery replaced by thyroid ima artery. In the

current study, Inferior thyroid artery was absent in 3 (5.5%) and Thyroid ima artery was not found in any of them.

According to Henry Gray [11], the inferior thyroid artery ascends posterior to the carotid sheath and middle cervical sympathetic ganglion along the anterior border of Scalenius anterior. Gardner [5] stated that the inferior thyroid artery crossed either behind or in front of the sympathetic chain at the level of C7 or T1 vertebra and may be related to the middle cervical ganglion. Hollinshead [12] observed that the inferior thyroid artery was much variable in both its position of origin and in its relation to the cervical sympathetic chain and middle cervical ganglion. Rajamadhava et al., [13] has described the variations of the external laryngeal nerve and recurrent laryngeal nerve to superior and inferior thyroid arteries to assist surgeons during thyroidectomies, radical neck dissection and removal of neck masses.

In the present study on fetuses, Inferior thyroid artery in most of the cases was found posterior to the sympathetic chain than anterior to it. The RLN, inferior thyroid artery and sympathetic chain in one case were lying parallel to each other and in 3 other cases, the inferior thyroid artery passed through the sympathetic chain. The finding observed in this study may act as a cornerstone for safely performing cervical sympathectomies in infants when indicated.

LIMITATIONS

Although the etiology of sudden infant death syndrome is still idiopathic, delayed vagal maturation and involvement of both arousal responses and cardiac autonomic controls during sleep wake process have been suggested as underlying causes. Some molecular genetic studies attribute it to mutations in gene encoding cardiac myocyte ion channels. Thus, treatment modalities and the need of cervical sympathectomies may vary in future.

CONCLUSION

In spite of the surgical and functional importance of the cervical sympathetic chain and inferior thyroid artery, it has not been well documented especially in fetuses. Cervical and

cervicothoracic sympathectomies are emerging as choices of treatment for Sudden Infant Death Syndrome, epilepsies, Raynauds syndrome and vascular disorders of the upper extremity. Hence, knowledge of the varied relations of the inferior thyroid artery to the sympathetic chain encountered in this study is essential.

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