Complications of Neck Dissection in Thyroid Malignancy

Thesis

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ATA	American Thyroid Association
ATC	Anaplastic thyroid carcinoma
AUS	Atypia of undetermined significance
CT scan	Computed tomographic scan
DTC	Differentiated Thyroid Cancer
EBSLN	External branch of Superior Laryngeal Nerve
FA	Follicular adenoma
FC	Follicular carcinoma
FLUS	Follicular lesion of undetermined significance
FMTC	Familial medullary thyroid carcinoma
FNA	Fine needle aspiration
FVPTC	Follicular variant PTC
IBSLN	Internal branch of Superior Laryngeal Nerve
IJV	Internal Jugular Vein
ITA	Inferior thyroid artery
LNs	Lymph Nodes
MEN	Multiple endocrine neoplasia
MMN	Marginal mandibular nerve
MRI	Magnetic resonance imaging
MTC	Medullary thyroid carcinoma

PDC	Poorly differentiated carcinoma
PIT	Positron emission tomography
PTC	Papillary thyroid cancer
RAI	Radioactive iodine
RLN	Recurrent laryngeal nerve
RND	Radical Neck Dissection
SAN	Spinal accessory nerve
SCM	Sternocleidomastoid muscle
SLN	Superior Laryngeal Nerve
STA	Superior thyroid artery
TIRADS	The Thyroid Imaging Reporting and Data **System**
TSH	Thyroid-stimulating hormone

INTRODUCTION

Thyroid cancer is the most frequent endocrine malignancy with an increasing incidence **(Merdad et al., 2013).**

Among histological subtypes, papillary thyroid carcinoma (PTC) accounts for 90% of cases. PTCs have a favorable 5-year survival rate (over 95%). However, about 5–10% PTC patients present recurrence after therapy **(Merdad et al., 2013).**

The incidence of thyroid cancer is about three to four times higher among females than males worldwide, ranking the sixth most common malignancy diagnosed in women. Thyroid cancer can occur at any age but it is rare in childhood and most tumors are diagnosed during the third to sixth decades of life **(Tuttle et al., 2017).**

While metastatic disease to regional nodes is frequently identified in patients with papillary thyroid cancer, occurring in 20-50% of patients in the central compartment of the neck (level VI) and in 10-30 % in the lateral compartmentof the neck (level II – V) it is very uncommon in patients with follicular cancer **(Mao and Xing, 2016).**

The classic treatment of thyroid cancer is thyroidectomy. Due to high incidecnce of lymph node metastasis, neck dissection is an important part for radical excision of the tumor and the decrease in the incidence of recurrence **(Mao and Xing, 2016).**

REVIEW OF LITERATURE

Anatomy of thyroid gland and related structure

The thyroid gland has two parts or lobes that are connected by the thyroid isthmus. The lobes have superior and inferior poles. The thyroid lobes can be flat or globular, but always have a three-dimensional shape as they curve around the trachea posteriorly. The thyroid isthmus is usually a narrow band of thyroid tissue overlying the second and third tracheal rings and connecting the two lobes of the thyroid. The thyroid isthmus can be wide, long or even absent, and may have a pyramidal lobe **(Braun et al., 2007).**

The pyramidal lobe extends superiorly from the isthmus and can reach the level of the hyoid bone. The identification and resection of a pyramidal lobe is an important step in assuring that a total or near total thyroidectomy has been completed adequately**(Bliss et al., 2000).**

Tubercle of Zuckerkandl is located on the posterior aspect of each thyroid lobe. The recurrent laryngeal nerve (RLN) usually traverses the posterior aspect of the tubercle, which can help the surgeon find and identify the nerve. The tubercle of

Zuckerkandl should be carefully elevated and rotated medially to identify the nerve as it courses posterior to the tubercle **(Pelizzo et al., 1998).**

Occasionally the tubercle tissue passes behind (deep) to the RLN as it enters thelarynx. The nerve should be look for in this situation and preserved throughout its course to avoid inadvertent division of the nerve (figure 1) **(Reeve and Delbridge, 1998).**

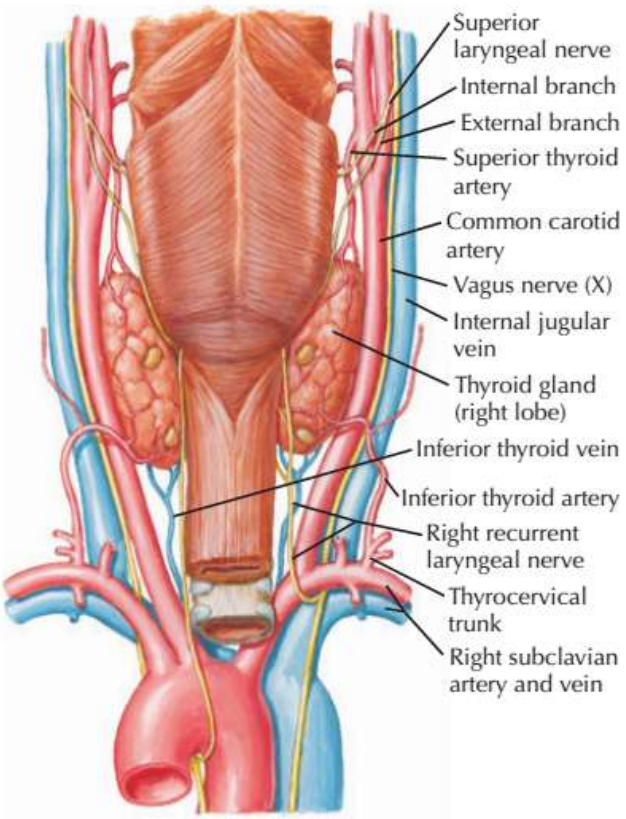

Figure 1: Thyroid Gland and Pharynx: Posterior View (Robert, 2011)

Blood supply

The thyroid is an extremely vascular gland. Its main arterial blood supply comes from the paired superior and inferior thyroid arteries **(Mohebati and Shaha, 2012).**

The origin of the **superior thyroid artery** (STA) is variable but most commonly will arise from the external carotid artery. The STA travels along the external surface of the inferior constrictor muscle and enters into the thyroid gland posteromedially near the upper pole of the lobe **(Gupta et al., 2014).**

The **inferior thyroid artery** (ITA) has a variable distribution and is absent on one side (usually the left) in approximately 0.2 to 6% of cases. After branching from the thyrocervical trunk off the subclavian artery, it ascends posterior to the carotid sheath and has a variable relationship with the sympathetic chain. Prior to entering the gland, the ITA divides into an upper and a lower branch. The upper branch goes to the posterior aspect of the gland, and the lower branch to the lower pole of the gland. There can be anastomoses with the STA as well as with the contralateral ITA across the midline **(Fancy et al., 2010).**

A thyroidea ima artery is found in approximately 3 % of individuals and arises from the aortic arch or innominate artery and courses to the inferior portion of the isthmus or inferior thyroid poles **(Bliss et al., 2000).**

The thyroid gland is drained by large veins that exhibit extensive cross filling from both sides of the thyroid through a valveless venous plexus **(Fancy et al., 2010).**

On each side of the gland, three veins arise: the **superior, middle, and inferior thyroid veins**. The superior thyroid vein, which drains the upper two-thirds of the ipsilateral thyroid lobe, accompanies its corresponding artery and emerges from the upper pole of the thyroid. It primarily empties into the internal jugular vein; however, in some cases the superior thyroid vein will terminate into the linguo-facial trunk and common facial vein **(Wafae et al., 2010).**

Like the superior thyroid vein, the middle thyroid vein typically drains the superior two-thirds of the thyroid into the internal jugular vein (a few centimeters below the superior thyroid vein) after crossing the common carotid artery anteriorly **(Fancy et al., 2010).**

The paired inferior thyroid veins emerge from the lower portion of the gland and have abundant cross filling with the