CHAPTER 4
Anatomy and Anomalies

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INTRODUCTION
Real-time ultrasound was introduced in the 1980’s and rapidly proved to be the most sensitive and efficient method to evaluate thyroid anatomy. The superficial location of the soft tissue structures in the anterior neck also allows the physician to study the anatomy of the entire area and detect anatomic variations as well as identify extra thyroidal masses (1,2). Often patients present with a neck mass thought to be of thyroid origin, but ultrasound quickly and easily identifies it of extrathyroidal origin. This use of ultrasound to define the anatomy of the neck provides an excellent teaching tool in medical education to augment the physical examination. In this chapter we review the normal anatomy along with some common anomalies one might encounter in performing ultrasound.

ULTRASOUND TECHNIQUE
Patients are usually scanned in the supine position with the neck mildly hyperextended by an “oatmeal” pillow. Both lobes are scanned individually in the transverse and in the longitudinal planes. Any specific abnormalities should be studied in both planes by rotating the transducer 90 degrees over the area of concern. Remember that an ultrasound exam of the thyroid should always include the entire neck, looking for abnormal lymph nodes, enlarged parathyroid glands and abnormal masses. Ultrasound of the post-operative neck and evaluation for parathyroid disease will be discussed in later chapters.

NORMAL ANATOMY
In order to recognize neck pathology, it is important to be familiar with the anatomy and ultrasound appearance of the normal neck. A normal healthy thyroid lobe is pear-shaped in the transverse view and resembles “ground glass” in
appearance on the ultrasound monitor. It is bordered anteriorly by the strap muscles (sternohyoid, sternothyroid and omohyoid). Lateral to the thyroid lie the large sternocleidomastoid muscle, the carotid artery and the internal jugular vein. The *longus colli* muscle is posterior and the trachea is medial to the thyroid lobe. The parathyroid glands are posterior to the thyroid and usually not seen unless they are enlarged. The esophagus can also be seen protruding from behind the tracheal shadow posterior to the left lobe. Real-time ultrasound shows the vessels pulsating, and peristalsis can be seen in the esophagus when the patient is asked to swallow. Very rarely, the esophagus will be seen on the right.

Measurement of the volume of the thyroid gland is sometimes difficult using ultrasound because most modern small parts transducers have a footpad of only 4 cm or less, and the normal thyroid lobe is over 4 cm long. If the lobe is longer than the transducer, a “split screen technique” can be used to

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**Fig. 4.1.** Normal appearing thyroid in transverse view. Thyroid is homogeneous and slightly hyperechoic. The lobes are bordered anteriorly by the strap muscles (SM), posteriorly by the *longus colli* muscle (LC), medially by the trachea, and laterally by the sternocleidomastoid muscle (SCM), carotid artery and jugular vein. A portion of the esophagus (ESO) protrudes behind the tracheal shadow against the medial border of the left lobe.