In this lecture, the more commonly seen congenital lesions of the neck will be presented. These include branchial anomalies, thymic anomalies, and thyroid and thyroglossal duct anomalies. Vascular lesions and dermoid/epidermoid will also be discussed.

The branchial apparatus gives rise to most of the structures of the head and neck, comprising of branchial (or pharyngeal) arches, pouches, and clefts/grooves. In a cephalocaudal direction, there are 5 visible arches, which are periodic swellings. Consecutive arches are separated by clefts externally (covered by ectoderm) and pouches or grooves internally (covered by endoderm). During fetal development, these arches, pouches, and clefts undergo morphologic changes, ultimately giving rise to various vessels, cranial nerves, muscles, bones and cartilages, and other structures in their definitive forms. If, in the process, areas that are meant to undergo obliteration fail to do so (vestigial remnant theory), or there are trapped fetal cells that grow and canalize abnormally (cell rest theory), branchial anomalies including cysts, fistulas, and sinuses may result. They are classified and numbered according to their arch, pouch, or cleft of origin. They adopt fairly typical locations in the head and neck that allow them to be identified on imaging, but their provenance may be more definitively confirmed surgically by tracing the course of the fistula or sinus tract.

Branchial fistulas and sinuses are usually noticed at or soon after birth, manifesting as pits and/or areas of drainage. Cysts present later, in older childhood or early adulthood, typically as a neck mass following infection/inflammation. The most common branchial anomaly is the second branchial cyst. First branchial cysts are occasionally seen, usually in or around the parotid. Third or fourth branchial anomalies usually present as recurrent neck or thyroid infections related to a pyriform sinus fistula; third or fourth cysts are extremely uncommon.

The thymus develops from the third branchial pouch. Thymic promordia migrate caudally and medially along the thymopharyngeal ducts, join in the midline inferior to the thyroid gland, attach to the pericardium, and descend into the superior mediastinum. The thymopharyngeal ducts obliterate, atrophy, and disappear. If there is arrested migration, or if the thymopharyngeal ducts fail to obliterate, ectopic thymus, thymic cysts, or thyromonpharyngeal duct remnants or cysts may result along the embryologic route of migration.

The thyroid gland originates from primordium that is in the ventral midline at the eventual junction of the anterior two-thirds and posterior third of the tongue – the foramen cecum. The thyroid primordium elongates down as the “thyroid diverticulum”, which continues on as the thyroglossal duct. The primordium expands and bifurcates into the left and right thyroid lobes, connected by the isthmus, while the thyroglossal duct then undergoes regression. If there are trapped primordial cells or remnants along the thyroglossal duct, ectopic thyroid or thyroglossal duct cysts result.

Vascular lesions may be divided into tumors (neoplastic) and malformations (non-neoplastic). Vascular tumors are the hemangiomas, of which there are infantile (not present at birth, but develop very soon after) and congenital (present at birth) types. These are high-flow lesions with avid enhancement, and
they involute over time. When hemangiomas are seen, the radiologist should be aware of other possible findings on imaging that may indicate a diagnosis of PHACE or PHACES. Malformations include high-flow and low-flow varieties. Of these, the low-flow venous, lymphatic, and mixed venous/lymphatic malformations are not uncommonly seen in the head and neck. Venous malformations do not involute. Phleboliths and venous lakes are highly suggestive of venous malformations. Lymphatic malformations are present at birth, but may not become apparent until they enlarge in size following superinfection. Characteristic imaging findings of a lymphatic malformation are a micro- or macrocystic, unilocular or multilocular lesion with septations, fluid-fluid levels due to hemorrhage, and a transpatial nature.

Dermoid and epidermoid cysts have variable imaging appearances, but they are often in or near-midline, cystic, and may contain fat components.