Thyroid Duct Cyst

**ETIOLOGY/PATHOGENESIS**
- Derived from thyroglossal duct, which is connection between median anlage, foramen cecum, and descended thyroid gland
- Thyroglossal duct cyst (TGDC) is result of persistence of thyroglossal duct

**CLINICAL ISSUES**
- Fistulas may develop secondary to infection and may drain into skin or pharynx
- Papillary thyroid carcinoma may arise in TGDC

**IMAGING**
- Ultrasound and CT scan
  - Shows cyst intimately associated with hyoid bone with fluid density

**CYTOPATHOLOGY**
- Ciliated respiratory-type cells &/or squamous cells
- Mature lymphocytes

**MACROSCOPIC**
- Cysts vary greatly in size
  - 1- to 4-cm in diameter
- Usually contains clear fluid
- Smooth-walled cystic structure

**MICROSCOPIC**
- Midline location and distinct lining with lymphoid follicles
  - Helpful establishing diagnosis
- Cyst lined by respiratory epithelium
- Cyst wall may contain thyroid follicles

**TOP DIFFERENTIAL DIAGNOSES**
- Branchial cleft cyst and other benign embryologic abnormalities
- Cystic degeneration of colloid nodule in multinodular hyperplasia
- Lymphatic malformation
- Abscess

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**Graphic of Thyroglossal Duct and Cyst**

**High Power of Thyroglossal Duct Cyst**

**Cyst Wall of Thyroglossal Duct Cyst**

*Left* Sagittal oblique graphic shows the course of a thyroglossal duct cyst from the foramen cecum to the thyroid bed. Note the close relationship to the midportion of the hyoid bone. The cyst can occur anywhere along this tract. *Right* Thyroglossal duct cyst shows ciliated respiratory-type epithelium lining cells in juxtaposition to scattered thyroid follicles. The cyst fluid is usually clear, fibrinous, and acellular.

*Left* The high-power view highlights the cyst wall lined by a cylindrical, ciliated-type respiratory epithelium and a submucosa with lymphocytic infiltration. *Right* Histologic sections of a thyroglossal duct cyst shows both respiratory-type epithelium and an adjacent epithelium with squamous metaplasia. Note a lymphoid follicle in the cyst wall, a characteristic feature of thyroglossal duct cysts.
TERMINOLOGY

Abbreviations
- Thyroglossal duct cyst (TGDC)

Definitions
- Developmental anomaly derived from persistence of thyroglossal duct
  - Leading to development of cysts and fistulas

ETIOLOGY/PATHOGENESIS

Developmental Anomaly
- Derived from thyroglossal duct, which is connection between median anlage, foramen cecum, and descended thyroid gland
  - TGDC is result of persistence of thyroglossal duct
- Knowledge of typical course of thyroid primordium during embryologic development is essential to understand variant locations along this path where thyroid tissue can be found
- Migration of thyroid primordium begins at foramen cecum at base of tongue and then loops around hyoid bone anteriorly and inferiorly and descends anteriorly to thyrohyoid membrane into orthotopic location in infrahyoid portion of neck
- Thyroid ectopia is categorized into 1 of 4 typical locations with respect to this embryologic course
  - Base of tongue
  - Adjacent to hyoid bone
  - Midline infrahyoid portion of neck
  - Rarely in lateral part of neck

CLINICAL ISSUES

Epidemiology
- Incidence
  - No predisposition for male or female gender
  - Usually presents before 4th decade of life
  - 685 patients were recently described (344 males; 341 females)
    - Age at presentation was bimodal (1st and 5th decades) and ranged from 0.8-87.0 years (mean: 31.3 years)
    - Males predominate in children (150:111); females in adults (230:194)

Presentation
- Most frequently present with mobile midline neck mass in infrahyoid location
- Located at or below level of hyoid bone in anterior midline of neck
- Usually between 1-4 cm in diameter
  - Average cyst size: 2.4 cm
  - Pediatric patients have smaller cysts (mean: 2.1 cm) than adults (mean: 2.8 cm)
- Fistulas may develop secondary to infection and may drain into skin or pharynx
- Radiological studies demonstrate midline cystic area
  - Expansion or destruction of cartilaginous structure of hyoid may occur

Treatment
- Surgery
  - Necessary to avoid potential complications of fistulas
    - In rare instances, TGDCs can rupture and lead to life-threatening complications

Prognosis
- Cancer has been reported in TGDCs
  - Most common is papillary thyroid carcinoma
    - Occurs in 3.2% of all TGDCs in series of 685 cases
      - 22 patients (17 females, 5 males)
      - Aged 12-64 years (mean: 39.9 years; median: 39.0 years)
    - Typical cytologic and morphologic features of papillary thyroid carcinoma in context of cyst
    - Papillary thyroid carcinoma in TGDC is more common in women than men, tends to have classic morphologic features of papillary carcinoma, and carries similar prognosis
    - All of tumors are classic PTC, showing sclerotic and infiltrative pattern
  - Other malignancies
    - Adenosquamous cell carcinoma arising in TGDC
- Infected, rupture
  - May lead to life-threatening complications if not treated early
- Recurrence after surgery: 10%

IMAGING

CT Findings
- Imaging characteristics of TGDC as simple cyst and of ectopic thyroid tissue as hyperattenuating soft tissue mass at CT
- From retrospective study of all CT and MR imaging studies obtained in head and neck region
  - From over 60,00 CT and MR images, 69 cases (0.1%) had TGDCs
  - Ages ranged from 3 days to 17 years old, with the mean age at 5 years
  - Locations varied with majority at base of tongue (83%) followed by hyoid (13%) then infrahyoid straps (4%)
  - Sizes ranged from 2-28 mm with average size at 8 mm

MACROSCOPIC

General Features
- 1- to 4-cm cyst; usually contains clear fluid
- Smooth-walled cystic structure
  - May contain brown fluid
  - When infected, may contain purulent material
- Fistulas may occur secondary to inflammation and infection
  - May open into pharynx or skin
  - May have drainage

MICROSCOPIC

Histologic Features
- Cysts are usually lined by ciliated respiratory-type epithelium
  - ~38% are lined by respiratory epithelium alone
  - ~10% are lined by squamous epithelium alone
Thyroglossal Duct Cyst

- 50% are lined by both respiratory and squamous epithelium
- Cyst wall contains lymphoid aggregates and lymphoid follicles
- Squamous metaplasia may be present
  - Occurs in setting of chronic inflammation within TGDC
  - Squamous cell carcinoma subtypes may rarely occur in setting of TGDC
- Granulation tissue and loss of epithelium may be seen after inflammation and infection
  - It may be associated with skin fistula in ~ 10% of cases
- Cyst wall may contain thyroid follicles
  - ~ 70% TGDC has associated thyroid gland tissue present within cyst wall
- Papillary thyroid carcinoma was identified in 22 patients (3.2%) in series of 685 cases
- Xanthogranulomatous inflammation with accumulation of foamy histiocytes, multinucleated giant cells (Touton type), cholesterol clefts, and chronic inflammatory cells may occur

Cytologic Features
- Squamous or respiratory cells
  - Inflammatory cells usually composed of mature lymphocytes

DIFFERENTIAL DIAGNOSIS

Neoplastic vs. Nonneoplastic
- Carcinoma, lymphoma
  - Metastatic cystic papillary thyroid carcinoma may be difficult to distinguish from papillary thyroid carcinoma occurring within TGDC
  - Presence of respiratory or squamous epithelium as well as anatomic location helps in differentiation
- Squamous cell carcinoma
- Other benign cysts
  - Epidermoid cysts may be present in thyroid gland
    - Lined by squamous epithelium
      - They may be filled with keratin
      - Does not contain lymphoid follicles in wall
  - Branchial cleft cyst and other benign embryologic abnormalities
  - Cystic degeneration of colloid nodule in multinodular hyperplasia
  - Lymphatic malformation
  - Abscess
  - Saccular cyst
  - Relationship of mass to landmarks as
    - Foramen cecum, hyoid bone, strap muscles, thyrohyoid membrane, and thyroid cartilage
    - May help differentiate TGDC and ectopic thyroid tissue from other anterior neck masses when embryologic thyroid course is considered

SELECTED REFERENCES

Axial CECT shows a thyroglossal duct cyst at the level of the hyoid bone embedded in strap muscles. The cyst abuts the hyoid bone and impinges on the preepiglottic space. Thyroglossal duct cyst shows a cyst lined by a ciliated epithelium-lined wall with lymphoplasmacytic infiltration in the submucosa. Note dilated vessels in the wall and an amorphous material in the lumen.

Microphotograph shows a papillary thyroid carcinoma that arose in a thyroglossal duct cyst with the typical nuclear features of papillary carcinoma and with the presence of psammoma bodies. Histological section shows a papillary thyroid carcinoma, classic variant, arising within a thyroglossal duct cyst. The papillary architecture and the nuclear features are characteristic of papillary carcinoma.

Immunohistochemistry for TTF-1 in Thyroglossal Duct Cyst With Carcinoma. These areas show TTF-1 immunostain positivity in this papillary thyroid carcinoma. These tumors have a similar immunophenotype as the tumors from thyroid origin.

BRAF in Papillary Thyroid Carcinoma ARISING in Thyroglossal Duct Cyst. BRAF immunostain shows immunopositivity in the cytoplasm of the tumor cells of this papillary thyroid carcinoma arising within a thyroglossal duct cyst. The BRAF immunopositivity correlates with the BRAF V600 mutation.