Parathyroid Gland

CHAPTER 22

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Objectives:

Upon completion of this presentation, students will be able to:

- Identify the embryology of the parathyroid gland.
- Describe the normal anatomy and physiology of the parathyroid gland, as well as relational anatomy.
- Discuss laboratory values and clinical findings .
- Describe the indications and sonographic examination of the parathyroid.
- Recognize parathyroid pathologic conditions and their sonographic appearances.

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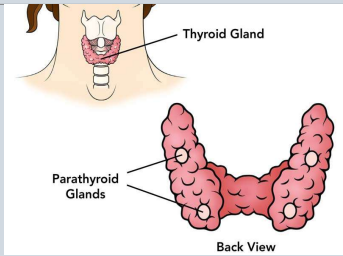
PARATHYROID GLANDS



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Anatomy of the Parathyroid Gland

- Normally located on posterior medial surface of thyroid gland
- Four parathyroid glands (some may have three or five)
  - paired, two lie posterior to each superior pole of thyroid and two lie posterior to each inferior pole
- Have been found in ectopic places, such as in neck and mediastinum

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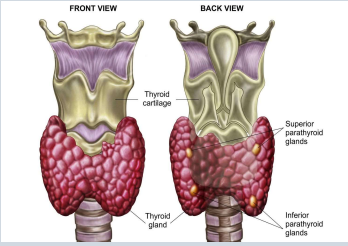
Anatomy of the Parathyroid Gland



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Anatomy of the Parathyroid Gland (cont'd)

- Each gland flat and disc-shaped
- Echotexture similar to that of overlying thyroid gland
- Normal-size glands (<4 mm) usually not seen with sonography
- Enlarged glands (>5 mm) have decreased echotexture and appear as elongated masses between posterior longus colli and anterior thyroid lobe

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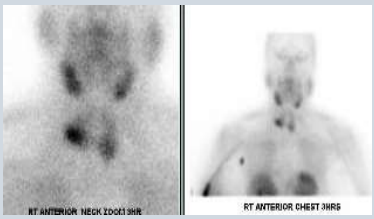
Anatomy of the Parathyroid Gland



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Parathyroid Physiology and Labs

- Regulate serum calcium in the blood
- Produces parathyroid hormone (PTH) that monitors serum calcium feedback mechanism
- Stimulus to PTH secretion is decrease in level of blood calcium.
- When serum calcium level decreases, parathyroid glands are stimulated to release PTH

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Parathyroid Physiology and Labs (cont'd)

- Serum calcium level *increases;* parathyroid activity decreases.
- PTH acts on bone, kidney, and intestine to enhance calcium absorption

*Unexplained hypercalcemia detected on routine blood chemistry screening is most common referrals for parathyroid sonography.

- Symptomatic renal stones, ulcers, and bone pain are other indications

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Hypocalcemia

- Low serum calcium levels
- Symptoms may include:
  - -hyperirritability
  - -fatigue
  - -anxiety
- Mild decrease in calcium, symptoms include:
  - -numbness around mouth
  - -tingling or numbness in the extremities
  - -muscle cramps
- Severe calcium decrease, symptoms include:
  - -dementia
  - -depression
  - -psychosis
  - -seizures

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Hypercalcemia

- Excessive calcium affects renal, skeletal, and GI systems
- Symptoms include:
  - -weight loss
  - -anorexia
  - -dyspepsia
  - -peptic ulcer
  - -pancreatitis
  - -nausea

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Sonographic Evaluation of the Parathyroid Gland

High-resolution (7.5- to 15-MHz) linear transducer.

Patient placed supine with neck slightly hyperextended.

Upper neck (jaw to sternal notch), transverse and longitudinal planes of thyroid/parathyroid area.

Patient asked to swallow to elevate thyroid gland during real-time scanning.

Under usual circumstances, not common to be able to visualize normal parathyroid glands.

Size: 5 mm x 3 mm x 1 mm.

Oval or bean-shaped. Also reported as spherical, elongated, or lobulated.

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Sonographic Evaluation of the Parathyroid Gland

- Longus colli muscle: appears as discrete area posterior to thyroid
- Longitudinal sections: Linear appearance of muscle evident in this plane
- Minor neurovascular bundle may also be source of confusion
- Longitudinal scans can often eliminate confusion by identifying bundle's tubular appearance

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Pathology of the Parathyroid Gland

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Primary Hyperparathyroidism

- Occurs when increased amounts of PTH produced by adenoma, primary hyperplasia, or (rarely) carcinoma
- State of increased function of parathyroid glands
- Women have primary hyperparathyroidism 2 - 3 times more frequently than men; particularly common after menopause
- Characterized by hypercalcemia, hypercalciuria, and low serum levels of phosphate (hypophosphatasia)

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Hyperplasia

- Of patients with hyperparathyroidism, approximately 10% have parathyroid hyperplasia
- Primary hyperplasia defined as hyperfunction of all parathyroid glands with no apparent cause
- Only one gland may significantly enlarge, with remaining glands only mildly affected, or all glands may be enlarged (>1 cm)

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Hyperplasia

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Hyperplasia (cont'd)

- Usually involves all glands.
- Multiple adenomas may involve two or three of the glands.
- As glands become inconsistently enlarged, it becomes more difficult to separate lesions with sonography
- Correct diagnosis of parathyroid enlargement requires recognition of normal cervical structures (veins, arteries, esophagus, muscles), which can simulate adenomas and produce false-positive results.

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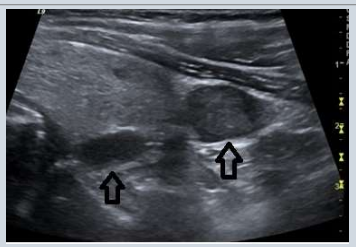
Hyperplasia



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Adenoma

- Most common cause of primary hyperparathyroidism (80% of cases)
- Solitary adenoma may involve any one of four glands with equal frequency
- Most common shape is oval
- 80% are single lesions
- Assoc. with radiation exposure

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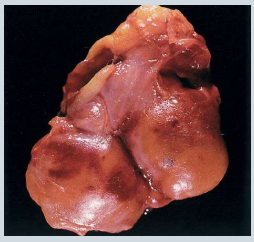
Adenoma



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Adenoma (cont'd)

Sonographic findings:

- Hypoechoic; vast majority solid.
- Usually <3 cm in size, with larger adenomas >5 cm in length.
- Superior parathyroid adenomas located adjacent to posterior aspect of mid portion of thyroid
- Location of inferior thyroid adenomas more variable, but may be found close to caudal tip of lower pole of thyroid
- Encapsulated with discrete border

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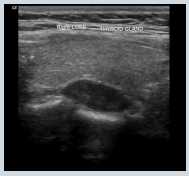
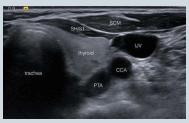

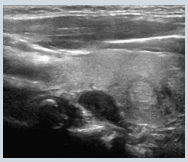

Adenomas

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Parathyroid Carcinoma

- Histologic differentiation of adenoma and carcinoma very difficult
- Metastases to regional nodes or distant organs, capsular invasion, or local recurrence must be present for cancer to be diagnosed
- Most cancers of parathyroid glands small, irregular, firm masses
- Mass may adhere to surrounding structures
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- On sonography, carcinoma usually larger than adenoma
- Malignant tumor has lobular contour, heterogeneous internal architecture, and internal cystic components

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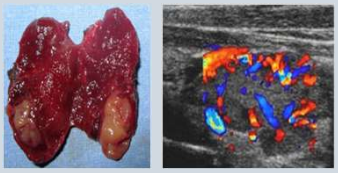
Parathyroid Carcinoma



The sonographic appearance of parathyroid cancer is usually larger, more irregular in shape, or with a lobulated contour. Note the prominent internal vascularity of the carcinoma.

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Secondary Hyperparathyroidism

- Chronic hypocalcemia caused by renal failure, vitamin D deficiency (rickets), or malabsorption syndromes
- Abnormalities induce PTH secretion, which leads to secondary hyperparathyroidism

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Secondary Hyperparathyroidism (cont'd)

- Hyperfunction of parathyroids apparently compensatory reaction
- Renal insufficiency and intestinal malabsorption cause hypocalcemia
  - leads to stimulation of PTH
- All four glands usually enlarged

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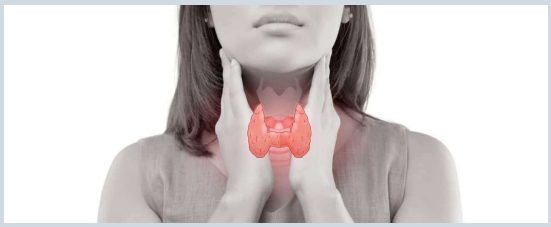
Review



https://entnova.com/ent/head-neck/thyroid-parathyroid/

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