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Primary Hyperparathyroidism

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Hyperparathyroidism

- An increase in parathyroid hormone (PTH) production
- Divided into Primary, Secondary and Tertiary based on the underlying pathology
- Primary – autonomous, spontaneous overproduction of PTH
- Secondary & Tertiary – usually seen as sequelae of chronic renal failure



Primary Hyperparathyroidism

- More common in women than men
- Incidence is estimated to be 25 in 100,000
- Most cases occur in the 50's or later
- Symptoms may include:
 - Muscle weakness, constipation, bone pain, renal stones, depression



Diagnostic Workup

- Diagnosed by chemical assays often before the patient is symptomatic
 - A serum PTH level that is elevated in the presence of hypercalcemia confirms the diagnosis
- ~ 40% of cases are diagnosed before there is radiologic evidence:
 - osteopenia
 - subperiosteal resorption



Our Patient

- 70 year old female with a history of lymphoma
- An elevated serum calcium level was found at routine follow-up
- Further evaluation revealed an elevated PTH level
- Preoperative imaging of the parathyroid glands was obtained

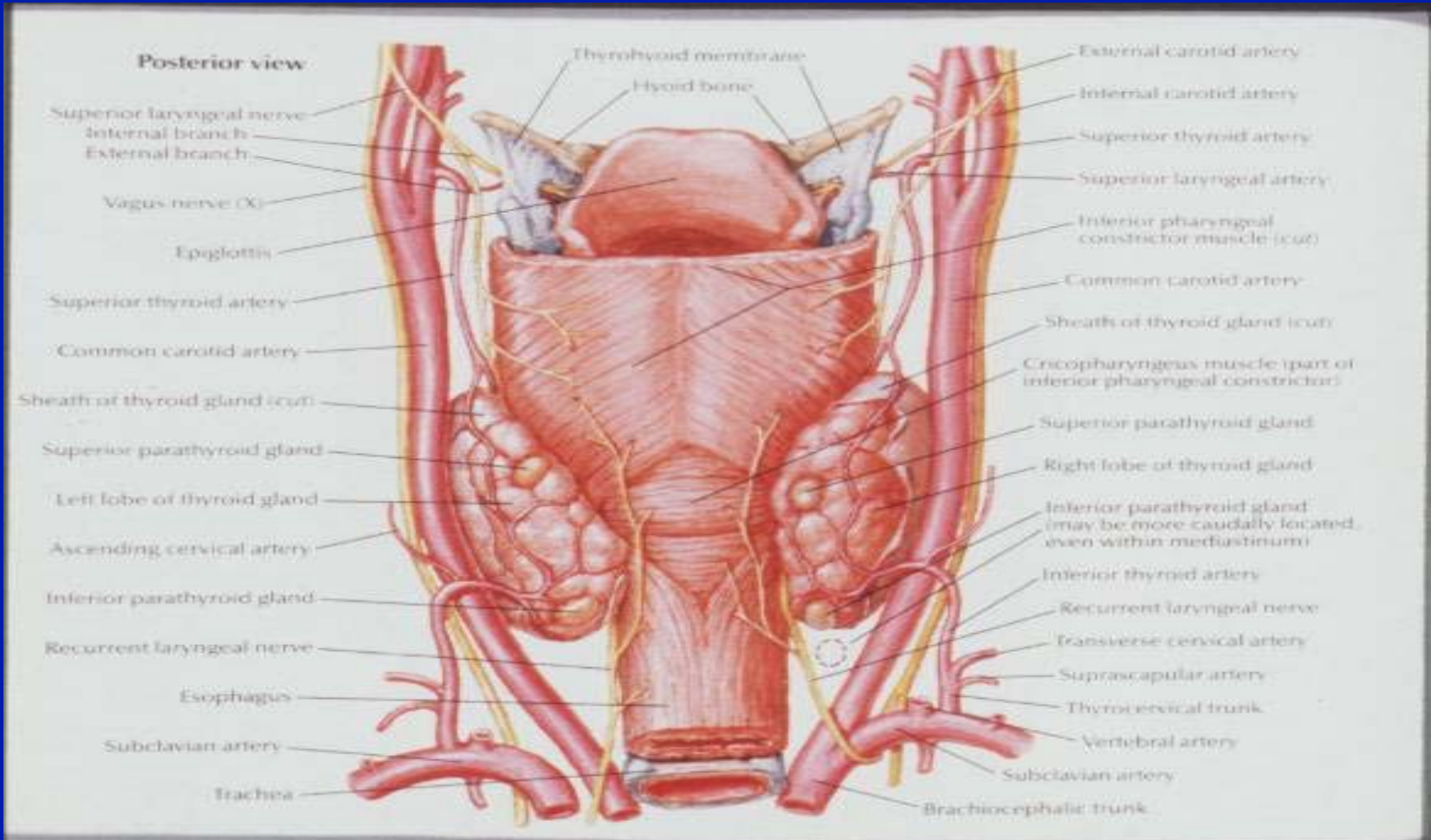


Differential Diagnosis

- Causes of Primary Hyperparathyroidism:
 - Single Adenoma 80-90%
 - Involves any of the 4 glands with equal frequency
 - Multiple gland enlargement 10-20%
 - Most commonly hyperplasia
 - Usually involves all 4 glands
 - Rarely multiple adenomas
 - Involves only 2 or 3 glands
 - Carcinoma <1%

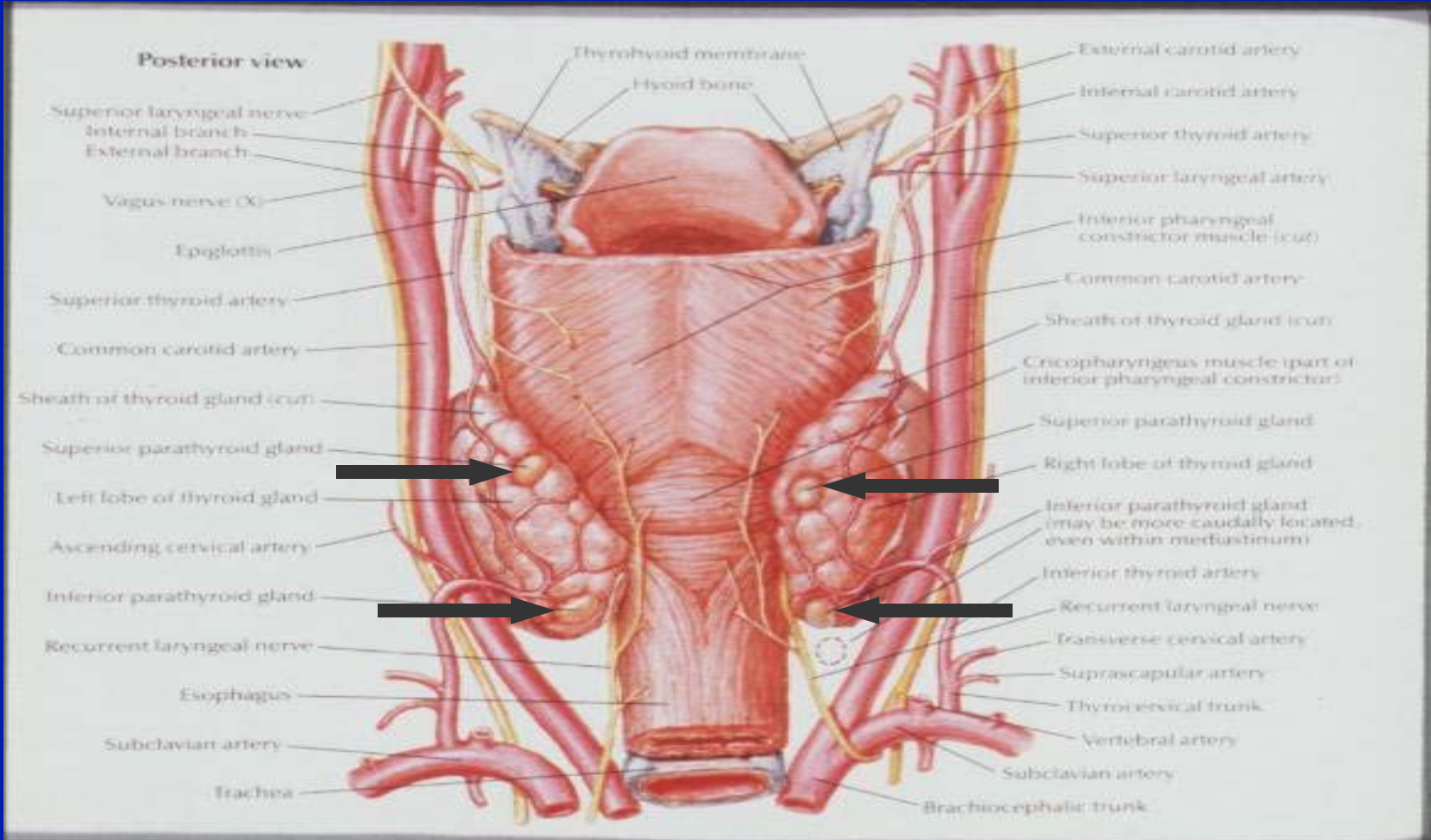


Anatomy





Anatomy





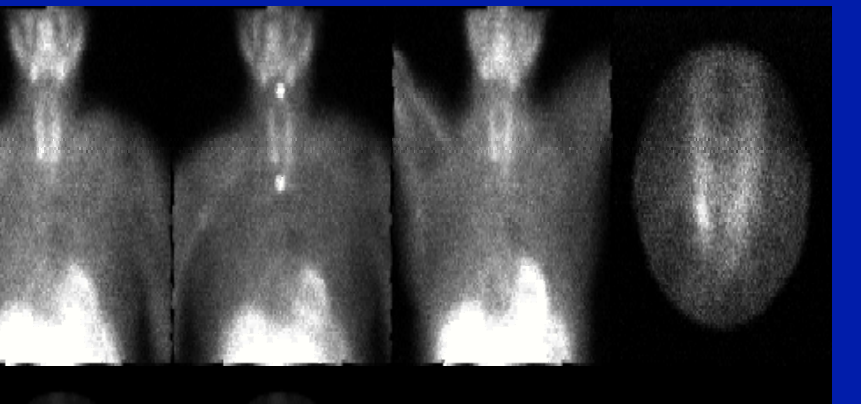
Imaging Modalities

- Nuclear Medicine
 - Technitium-99m sestamibi
- Ultrasound



Nuclear Medicine

- Technitium-99m Sestamibi
 - Small radiolabeled protein taken up by metabolically active organs
 - Images taken at intervals
 - 20 minutes
 - 2 hours

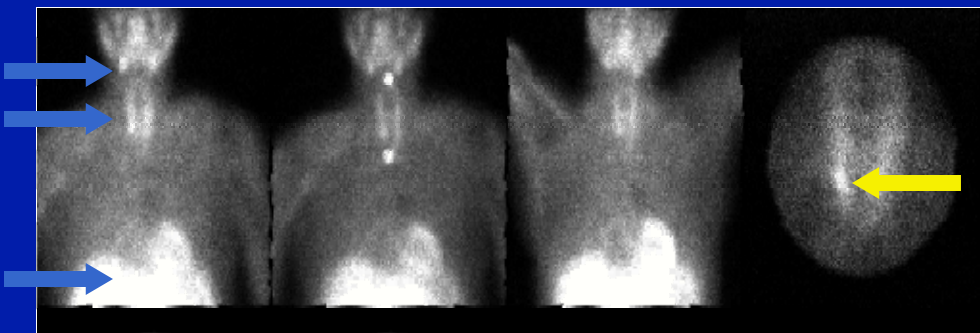


Courtesy of Dr. Donohoe, BIDMC



Our Patient at 20 minutes

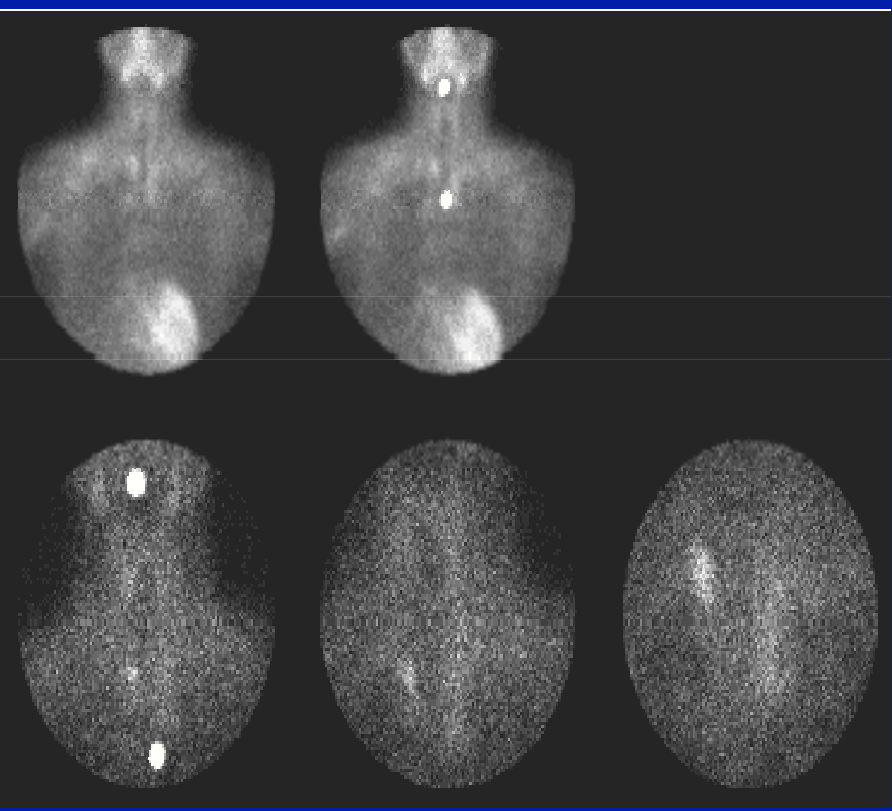
- 20 minute image shows diffuse uptake by the salivary glands, thyroid, and the heart
- On closer examination, there appears to be some increased signal in the right inferior parathyroid





Our Patient at 2 hours

- After 2 hours, there has been considerable washout
- On a coned-down view, an area of hyperintensity remains near the right inferior parathyroid



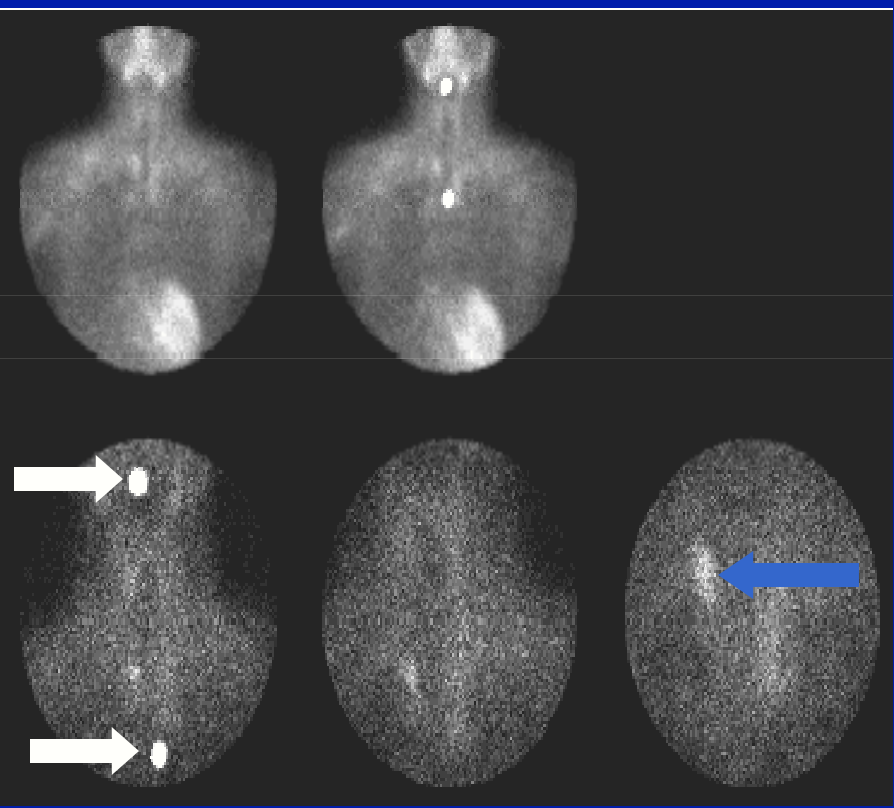
Courtesy of Dr. Donohoe, BIDMC



Our Patient at 2 hours

- Tc99m sestamibi is absorbed by the hyperactive parathyroid
- The normal parathyroid glands are inactive secondary to the hypercalcemia

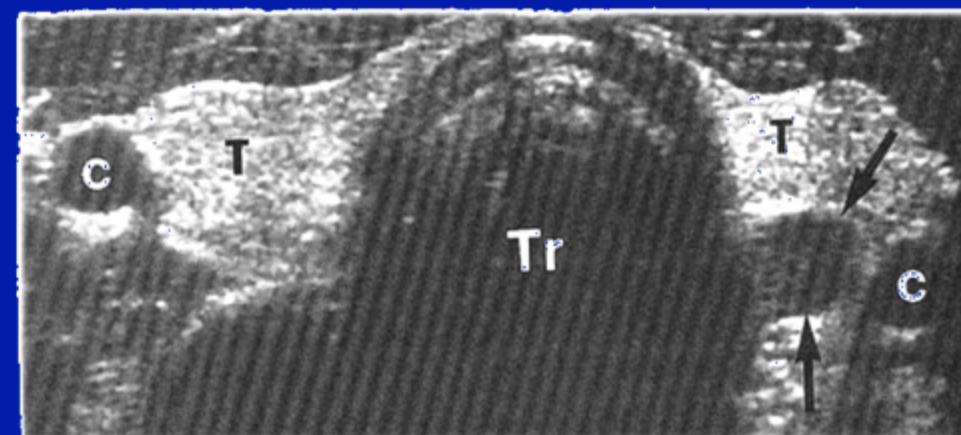
White arrows point to markers





Ultrasound

- High resolution sonographic evaluation of the neck is performed
- Patient is positioned with neck hyperextended
- A 10MHz or 7.5 MHz transducer is used for adequate penetration of the thyroid
- Normal parathyroid glands are generally not visualized



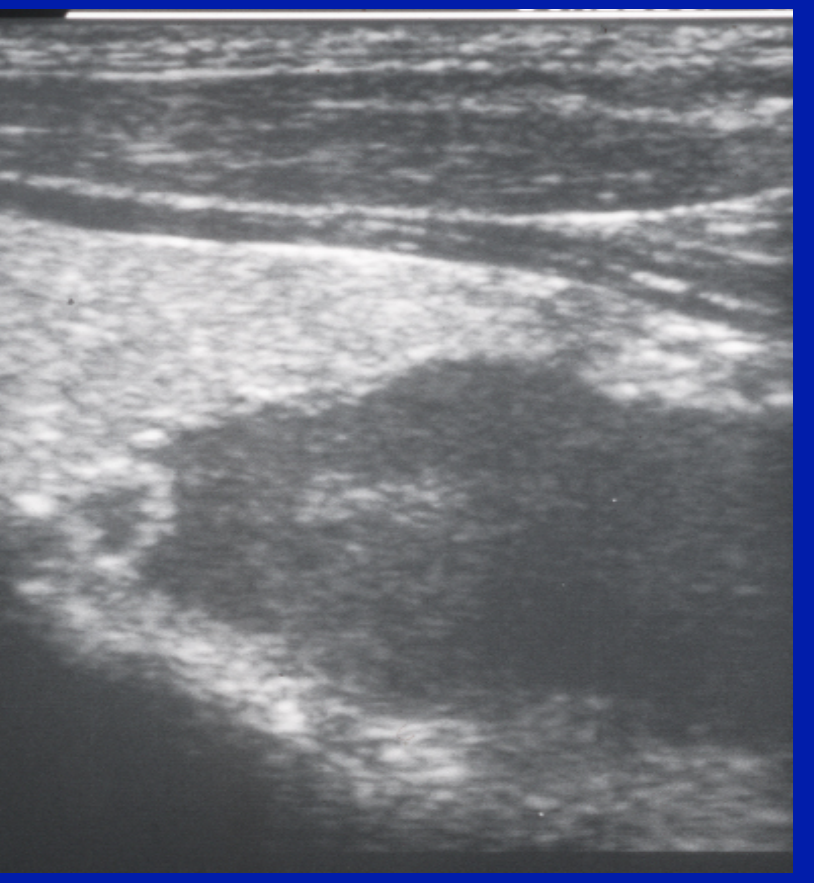
Transverse view of the thyroid/parathyroids.
Black arrows point to the adenoma.
C-common carotid artery

From: Rumack, Carol et al. Diagnostic Ultrasound, 2nd ed. Mosby-Year Book Inc. St. Louis, 1998.



Complimentary Patient #1

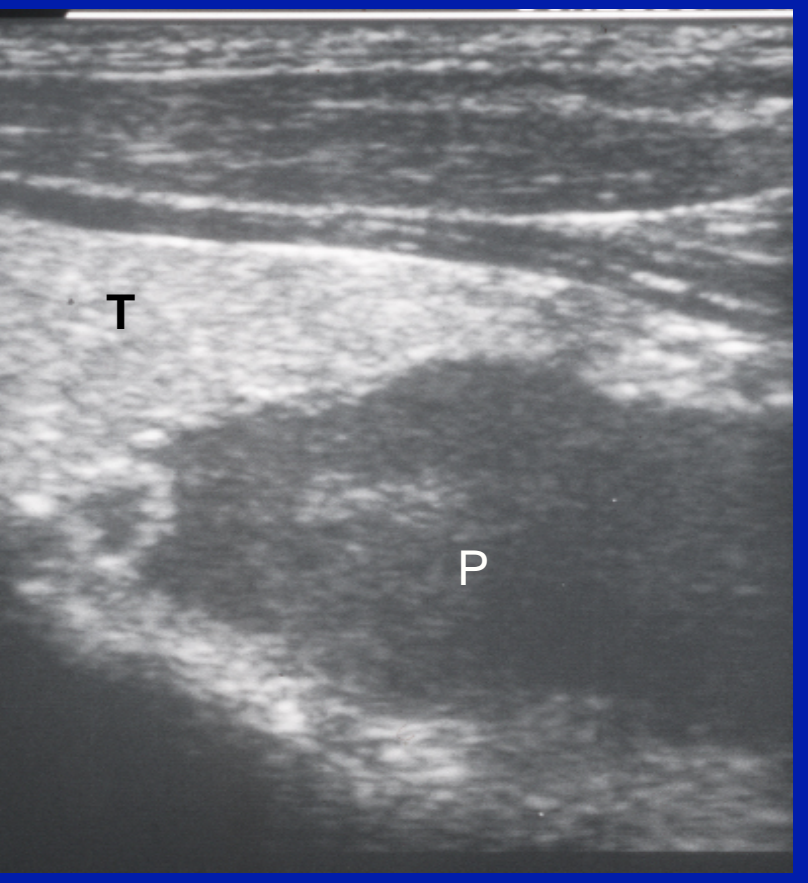
- Sagittal view of a large parathyroid adenoma
 - A discrete, sharply marginated, solid nodule
 - Usually oblong or teardrop shaped
 - Less echogenic than the adjacent thyroid tissue due to the uniform hypercellularity





Complimentary Patient #1

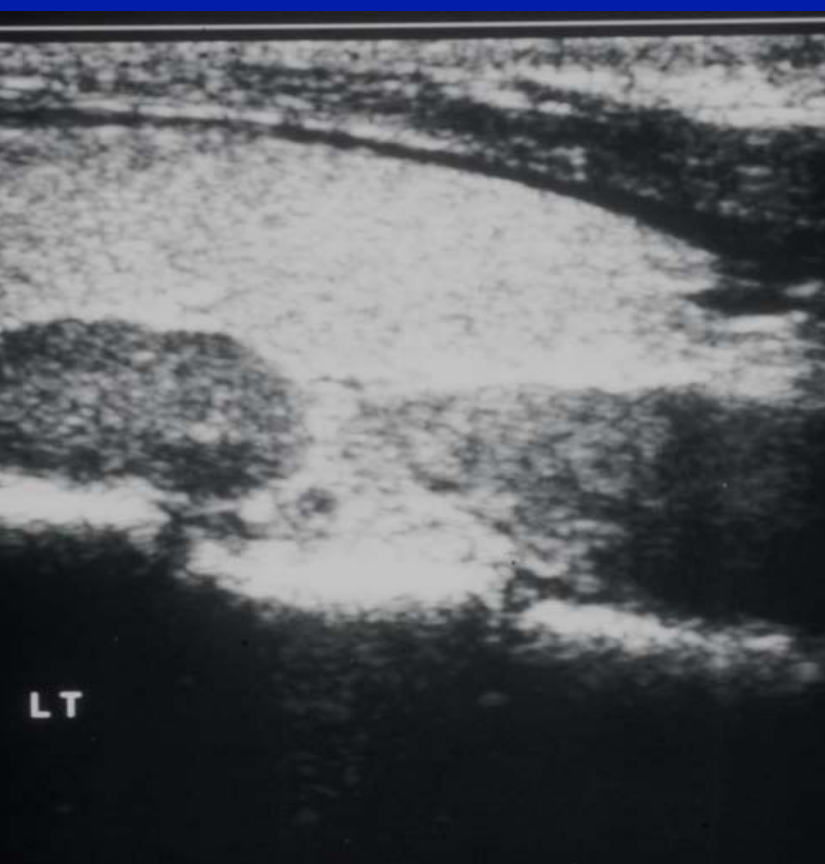
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Complimentary Patient #2

- Sagittal view with multiple adenomas
- Same characteristics as the previous adenomas

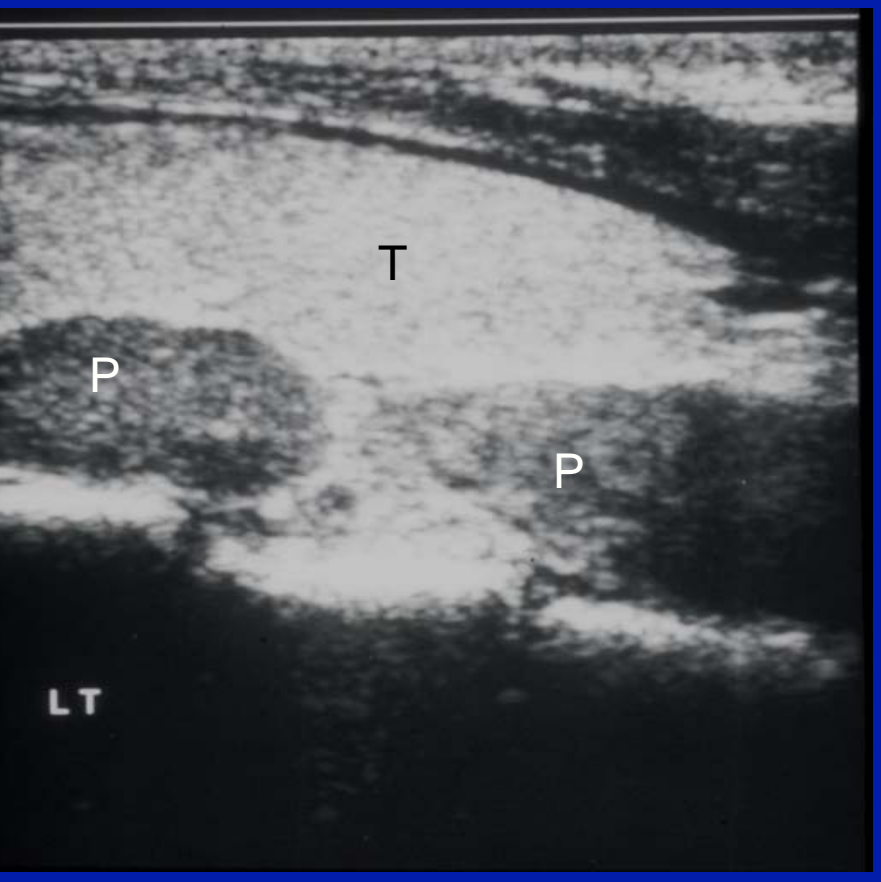


Courtesy of Dr. McArdle, BIDMC 17



Complimentary Patient #2

- Sagittal view with multiple adenomas
- Same characteristics as the previous adenomas





Our patient

- Patient was taken to the OR for a parathyroidectomy
- The right inferior parathyroid gland appeared enlarged and was removed
- Pathology reports confirmed the diagnosis of a parathyroid adenoma
- Hypercalcemia resolved



References

- Cotran, Ramzi S. et al. Robbins Pathologic Basis of Disease. 6th ed. W. B. Saunders Company. Philadelphia, 1999.
- Juhl, John H, et al. Paul and Juhl's Esentials of Radiologic Imaging. 6th ed. JB Lippincott Company, Philadelphia, 1993.
- McGahan, John P, MD. The Radiologic Clinics of North America – Ultrasonography of Small Parts. Volume 23. W. B. Saunders Company, Philadelphia, March 1985.
- Rumack, Carol et al. Diagnostic Ultrasound, 2nd ed. Mosby-Year Book Inc. St. Louis, 1998.
- <http://www.endocrineweb.com/sestamibi.html>



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