

RADIOLOGY

The Oral Boards Primer

Amit Mehta, MD
Douglas P. Beall, MD



 HUMANA PRESS

RADIOLOGY

RADIOLOGY

The Oral Boards Primer

By

AMIT MEHTA, MD

South Texas Radiology Group, San Antonio, TX

DOUGLAS P. BEALL, MD

*Chief of Radiology Services, Clinical Radiology of Oklahoma
and Associate Professor of Orthopedic Surgery,
Oklahoma University Medical Center, Oklahoma City, OK*



HUMANA PRESS
TOTOWA, NEW JERSEY

© 2006 Humana Press Inc.
999 Riverview Drive, Suite 208
Totowa, New Jersey 07512

www.humanapress.com

All rights reserved. No part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, microfilming, recording, or otherwise without written permission from the Publisher.

The content and opinions expressed in this book are the sole work of the authors and editors, who have warranted due diligence in the creation and issuance of their work. The publisher, editors, and authors are not responsible for errors or omissions or for any consequences arising from the information or opinions presented in this book and make no warranty, express or implied, with respect to its contents.

Due diligence has been taken by the publishers, editors, and authors of this book to assure the accuracy of the information published and to describe generally accepted practices. The contributors herein have carefully checked to ensure that the drug selections and dosages set forth in this text are accurate and in accord with the standards accepted at the time of publication. Notwithstanding, since new research, changes in government regulations, and knowledge from clinical experience relating to drug therapy and drug reactions constantly occur, the reader is advised to check the product information provided by the manufacturer of each drug for any change in dosages or for additional warnings and contraindications. This is of utmost importance when the recommended drug herein is a new or infrequently used drug. It is the responsibility of the treating physician to determine dosages and treatment strategies for individual patients. Further, it is the responsibility of the health care provider to ascertain the Food and Drug Administration status of each drug or device used in their clinical practice. The publishers, editors, and authors are not responsible for errors or omissions or for any consequences from the application of the information presented in this book and make no warranty, express or implied, with respect to the contents in this publication.

This publication is printed on acid-free paper. ∞

ANSI Z39.48-1984 (American National Standards Institute) Permanence of Paper for Printed Library Materials.

Cover design by Patricia F. Cleary

Cover illustrations from Chapter 2, "Chest Radiology" and Chapter 9, "Pediatrics."

For additional copies, pricing for bulk purchases, and/or information about other Humana titles, contact Humana at the above address or at any of the following numbers: Tel.: 973-256-1699; Fax: 973-256-8341, E-mail: orders@humanapress.com; or visit our Website: www.humanapress.com.

Photocopy Authorization Policy:

Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by Humana Press Inc., provided that the base fee of US \$30.00 per copy is paid directly to the Copyright Clearance Center at 222 Rosewood Drive, Danvers, MA 01923. For those organizations that have been granted a photocopy license from the CCC, a separate system of payment has been arranged and is acceptable to Humana Press Inc. The fee code for users of the Transactional Reporting Service is: [1-58829-357-2/06 \$30.00].

Printed in the United States of America. 10 9 8 7 6 5 4 3 2 1

eISBN: 1-59259-819-6

Library of Congress Cataloging-in-Publication Data

Mehta, Amit.

Radiology : the oral boards primer / by Amit Mehta, Douglas P. Beall.
p. ; cm.

Includes bibliographical references and index.

ISBN 1-58829-357-2 (alk. paper)

1. Radiology, Medical--Examinations, questions, etc. 2. Oral examinations.
[DNLM: 1. Radiology--United States--Examination Questions. WN 18.2 M498r 2006]

I. Beall, Douglas P. II. Title.

R896.M44 2006

616.07'572076--dc22

2006002111

Preface

One of the most difficult and stressful times in the career of any diagnostic radiologist is in the preparation for the oral board exam given by the American Board of Radiology. Oral boards often engender more angst than the written boards because the potential questioning could include any possible question or combination of questions and because the exam requires physical participation.

Radiology: The Oral Boards Primer is designed to provide information that is typical of that found on the oral board examination for diagnostic radiology. Cases are provided to illustrate typical pathology and to provide a visual source for the construction of a differential diagnosis. Once the differential is mentally rendered, the mnemonics may be used as a memory aid and to augment any missing components of the differential that would be considered important. The chapters are organized as close to the oral boards exam format as possible. The cases should be examined, interpreted, and completed in a very rapid fashion, allowing for many cases to be reviewed in a single sitting. The vast majority of the cases contain prototypical representations of pathology allowing this text to be used as a memory aid and as a case reference source for many years after one has taken and passed the oral board examination.

The book can be used both during residency and at the time of review for the oral board examination. *Radiology: The Oral Boards Primer* will assist greatly in the preparation for this examination and will contribute to the assuredness and confidence that comes from being adequately prepared. As always, a text can only improve through evaluation and evolution, and we welcome your comments.

A CD-ROM edition of the book (ISBN 1-58829-928-7), sold separately, is available for use on the reader's PC or PDA.

Amit Mehta, MD
Douglas P. Beall, MD

Acknowledgments

The following authors are acknowledged for their helpful contributions:

Yong C. Bradley, MD
Chief of Nuclear Medicine
Brooke Army Medical Center
San Antonio, TX

Nancy A. Brown, RT (R)(M)(M)(QM)
Radiologic Technologist
Wilford Hall Medical Center
San Antonio, TX

Liem Bui-Mansfield, MD
Chief of Musculoskeletal Radiology
Brooke Army Medical Center
San Antonio, TX

Neal Dalrymple, MD
Assistant Professor
Wilford Hall Medical Center
San Antonio, TX

David R. DeLone, MD
Wilford Hall Medical Center
San Antonio, TX

Judy Estroff, MD
Children's Hospital Boston
Boston, MA

Brian J. Fortman, MD
Assistant Professor
Medical University of South Carolina
Carolina Radiology Associates
Myrtle Beach, SC

Robert B. Good, MD
Chief of Interventional Radiology
Wilford Hall Medical Center
San Antonio, TX

David E. Grayson, MD
Assistant Professor
Wilford Hall Medical Center
San Antonio, TX

Lawrence Hofmann, MD
Assistant Professor of Radiology and Surgery
The Johns Hopkins Medical Institutions
Baltimore, MD

Melody E. Krumdieck, RT (R)(M)
Radiologic Technologist
Wilford Hall Medical Center
San Antonio, TX

Joe C. Leonard, MD
Professor of Radiology
University of Oklahoma Health Sciences Center
Oklahoma City, OK

Christopher J. Lisanti, MD
Chairman, Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

John C. Morrison, MD
Division Chief, Nuclear Medicine
Wilford Hall Medical Center
San Antonio, TX

Fletcher M. Munter, MD
Chief of Neuroradiology
Brooke Army Medical Center
San Antonio, TX

Dan L. Nguyen, MD
Associate Professor of Radiology
Chief of Ultrasound
University of Oklahoma Health Sciences Center
Oklahoma City, OK

Jeffrey James Peterson, MD
Assistant Professor of Radiology
Mayo Clinic Jacksonville
Jacksonville, FL

David P. Raiken, MD
Division Chief, Abdominal Imaging
Wilford Hall Medical Center
San Antonio, TX

Farid G. Ramji, MD, FRCPC
Assistant Professor of Radiology
Division of Pediatric Radiology
University of Oklahoma Health Sciences Center
Oklahoma City, OK

Todd S. Regier, MD
University of Oklahoma Health Sciences Center
Oklahoma City, OK

Randy Ray Richardson, MD
Wilford Hall Medical Center
San Antonio, TX

Richard Robertson, MD
Director of Neuroradiology
Children's Hospital Boston
Boston, MA

Thomas M. Seay, MD
Wilford Hall Medical Center
San Antonio, TX

Ernesto Torres, MD
Chief of Body Imaging
Brook Army Medical Center
San Antonio, TX

The following contributors were instrumental in gathering the images used throughout the volume:

Kevin P. Banks, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Scot E. Campbell, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Judy A. Estroff, MD
Associate Professor
Department of Radiology
Children's Hospital Boston
Boston, MA

Jason H. Eves, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Brian J. Fortman, MD,
Medical University of South Carolina
Carolina Radiology Associates
Myrtle Beach, SC

Chad W. Harston, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Todd M. Johnson, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Justin Q. Ly, MD
Department of Radiology
Wilford Hall Medical Center
San Antonio, TX

Victoria Trapanotto, DO
Department of Radiology
Children's Hospital Boston
Boston, MA

Eric E. Williamson, MD
Department of Radiology
The Mayo Clinic
Rochester, MN

Contents

Preface	v
Acknowledgments	vii
An Approach to the Oral Boards	xiii
1. Musculoskeletal Radiology	1
2. Chest Radiology	33
3. Gastrointestinal Radiology	59
4. Genitourinary Radiology	104
5. Head and Neck Radiology	135
6. Vascular and Interventional	161
7. Nuclear Medicine	177
8. Ultrasound	211
9. Pediatrics	303
10. Breast	333
11. Neuroradiology	347

An Approach to the Oral Boards

The oral boards attempt to cover a large amount of material in a short period of time. It is to your advantage to cover as much material as you can so that if one case does not go well, you have a big denominator to limit the significance of that particular case. As such, it is important to have an organized approach to each case. This not only shows the examiner that you are prepared, but also allows for an intelligent discussion.

THE 5Ds

Data
Detect
Describe
Differential
Diagnose

For each case use this approach.

1. Data

This is a quick description of the study and any pertinent data the examiner gives you: "This is a contrast-enhanced computed tomography scan of the chest in a 42-yr-old African-American female with a 1-yr history of shortness of breath."

2. Detect

After a quick review of the image, show the examiner you have found the pertinent abnormality: "The abnormality is throughout both lungs radiating from the hilar regions along the bronchovascular bundles."

3. Describe

Take a brief moment to describe the abnormality to show the examiner you are focusing on the correct finding. If you have incorrectly detected or described the abnormality, the examiner will redirect you to the correct path: "There is soft tissue opacity that spreads along the bronchovascular bundles from both hila. There is associated lymphadenopathy in both hilar regions and the mediastinum."

4. Differential

Use the mnemonics in this text to give a quick differential diagnosis: My top four considerations for this constellation of findings would include the following:

Sarcoidosis
Histoplasmosis or TB
Amyloidosis
Metastasis

5. Diagnose

Of the differential diagnoses you have provided, give the examiner your top choice and a reason: "Of these differential diagnoses, my top choice is sarcoidosis. The combination of the patient's demographic data and the finding of spread along the bronchovascular bundles associated with lymphadenopathy best supports this diagnosis."

1

Musculoskeletal Radiology

Includes plain film diagnosis in all areas of the musculoskeletal system plus any related special or imaging procedures, including CT, interventional techniques, and MRI.

GENERAL CASE CATEGORIES

1. General including Metabolic
2. Congenital
3. Tumors
4. Arthritis

General

BASILAR INVAGINATION

PF ROACH

Paget disease

Fibrous dysplasia

Rickets

Osteogenesis imperfecta, Osteomalacia

Achondroplasia

Cleidocranial dysplasia

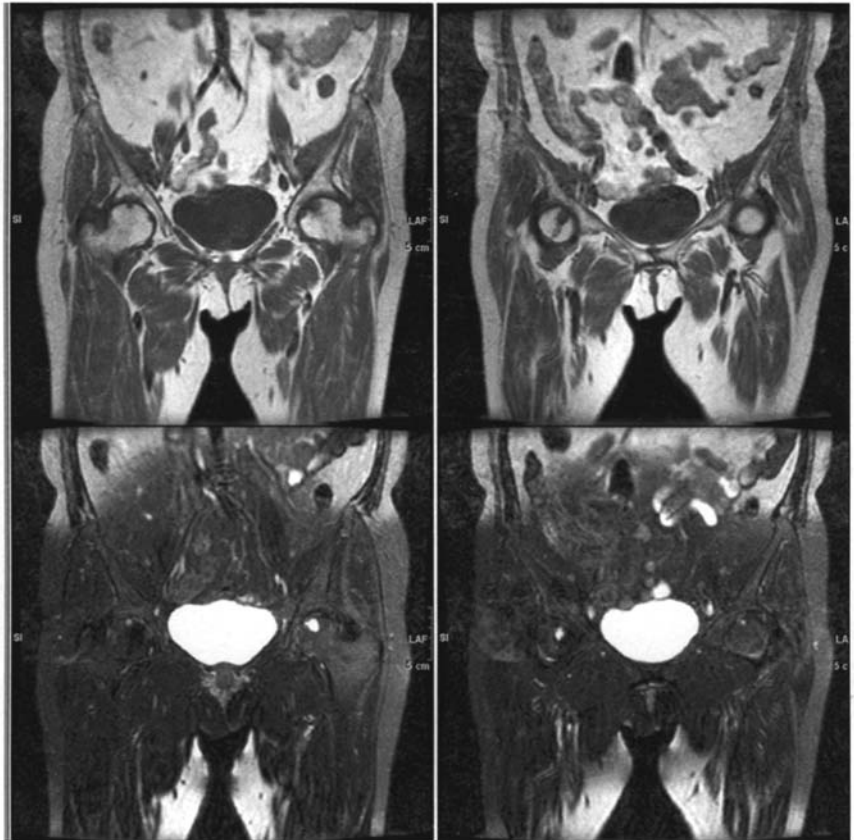
Hyperparathyroidism, Hurler syndrome



SUBCHONDRAL CYSTS

COORS

- CPPD
- Osteoarthritis
- Osteonecrosis
- Rheumatoid arthritis
- Synovial-based tumors



ACETABULAR PROTRUSION

PROTrusion

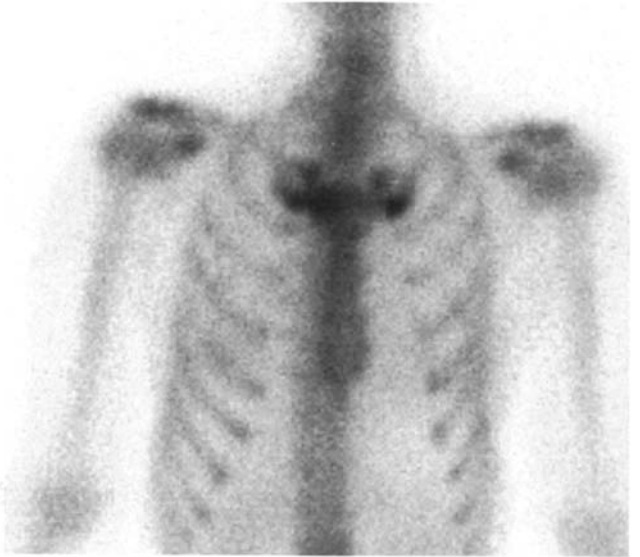
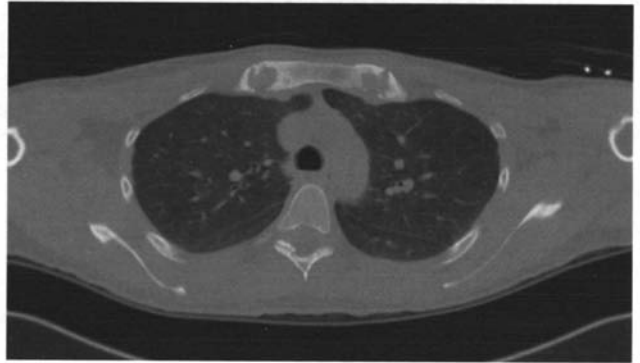
- Paget disease
- Rheumatoid arthritis
- Osteomalacia
- Trauma



STERNOCLAVICULAR SCLEROSIS

STOP

- SAPHO syndrome
- Traumatic osteolysis
- Osteomyelitis/Osteosarcoma
- Pagets



DISTAL CLAVICLE EROSION

SHIRT

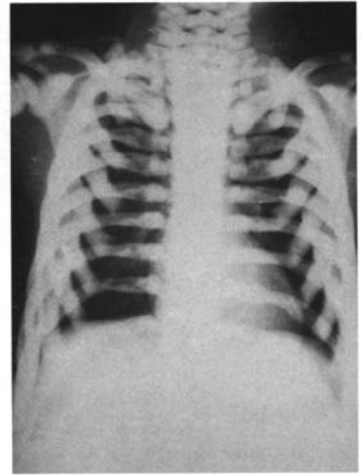
- Scleroderma
- Hyperparathyroidism
- Infection
- Rheumatoid arthritis
- Traumatic osteolysis



SCLEROSIS-GENERALIZED

R.S.M.O.P.M.M.P.F. (Regular sex mnemonic)

Renal osteodystrophy
 Sickle cell disease
 Myelofibrosis
 Osteopetrosis
 Pyknodysostosis
 Mastocytosis
 Metastasis
 Pagets
 Fluorosis



OSTEONECROSIS

ASEPTIC

Anemias
 Sickle cell disease/SLE
 ETOH/Exogenous steroids
 Pancreatitis
 Trauma
 Infection
 Caisson's disease



ACRO-OSTEOLYSIS

PINCH FO

- Psoriasis
- Infection
- Neuropathic
- Collagen vascular disease
- Hyperparathyroidism
- Familial (Hadju Cheney)
- Other—polyvinyl alcohol



CHONDRAL CALCIFICATION

HOGWASH

- Hyperparathyroidism
- Ochronosis
- Gout
- Wilson's Disease
- Arthritis
- Pseudogout
- Hemochromatosis



Congenital

ERLYMEYER FLASK

CHONGO

- Craniometaphyseal dysplasia
- Hemoglobinopathies
- Osteopetrosis
- Niemenn Pick
- Gaucher's Disease
- Other



METAPHYSEAL BANDS

DENSE

LINES

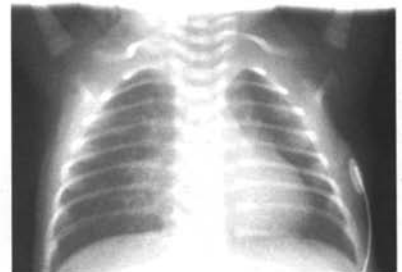
- Lead poisoning
- Infantile growth arrest
- Normal, 3 yr
- LEukemia treated
- Syphillis



LUCENT

NORMAL TENDER LOVING CARE

- Normal (neonates)
- TORCH
- Leukemia
- Chronic illness



GRACILE BONES

NIMROD

- Neurofibromatosis
- Immobilization
- Muscular dystrophy
- Rheumatoid arthritis
- Osteogenesis imperfecta
- Dysplasias



MADELUNG DEFORMITY

HITDOC

- Hurler syndrome
- Infection
- Trauma
- Dyschondrosteosis
- Osteochondroma
- Congenital–Turner’s syndrome



SHORT METACARPALS

BIC PEN

- Basal Cell Nevus syndrome
- Idiopathic
- Chromosomal–Turner’s syndrome
- Pseudohypoparathyroidism/PseudoPseudo-hypoparathyroidism



Tumors

DIAPHYSEAL LESIONS IN GENERAL

CEMENT

- Cysts
- Enchondroma
- Metastasis
- Eosinophilic granuloma (EG)
- Non-ossifying fibroma (NOF)
- TB/infections



CORTICAL LESION

MOFOS

- Metastasis
- Osteomyelitis
- Fibrosarcom
- Osteoid osteoma
- Stress fracture



ILIAC WING LESIONS

- Fibrous dysplasia
- Unicameral bone cyst
- Chondrosarcoma
- Mets/Myeloma/Plasmacytoma
- Ewings



VERTEBRA PLANA

IMELT

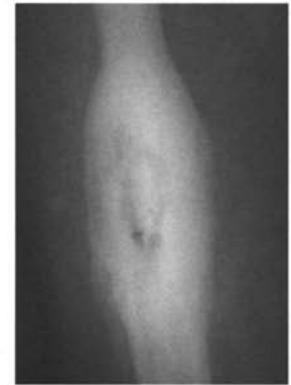
- Infection
- Mets/Myeloma
- EG
- Lymphoma/Leukemia
- Trauma



BONY SEQUESTRUM

LIFE

- Lymphoma
- Infection
- Fibrosarcoma
- EG



RIB LESION

FAME

- Fibrous dysplasia
- ABC
- Metastatic/Myeloma/Lymphoma
- EG/Enchondroma



EPIPHYSEAL LESIONS

CIGS

- Chondroblastoma
- Infection
- Giant cell tumor/Granuloma (EG)
- Subchondral cyst



FOCAL SCLEROTIC LESION

HOME LIFE

- Healed NOF
- Osteoma
- Metastasis
- Ewing's sarcoma
- Lymphoma
- Infection/Infarct
- Fibrous dysplasia
- Enchondroma



PERMEATIVE LESIONS

FIRE

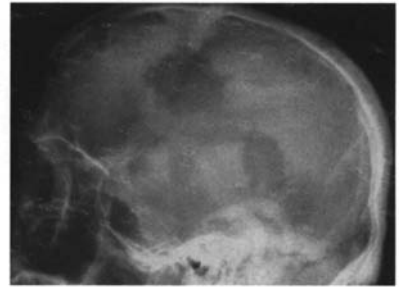
- Fibrosarcoma (Desmoid/MFH)
- Infection
- Round cell tumors
- EG
- Mets/Myeloma



SKULL LESION

MEL TORME

- Metastasis
- EG
- Lymphoma
- TB
- Osteomyelitis
- Radiation
- Mets
- Epidermoid



TIBIAL LESION

FOAM

- Fibrous dysplasia
- Osteofibrous dysplasia
- Adamantinoma
- Metastasis



POSTERIOR VERTEBRAL BODY LESION

GO TAPE

- Giant cell tumor
- Osteoblastoma
- TB
- ABC
- Paget disease
- EG



CALCANEAL LESION

BIG G

- Bone cyst-unicameral
- Intraosseous lipoma
- Ganglion
- Giant cell tumor



FINGER TIP LESION

GEMS

- Glomus tumor
- Epidermoid/Enchondroma
- Metastasis (lung almost exclusively)
- Sarcoid



SOFT TISSUE CALCIFICATION/OSSIFICATION

My GHOSTS

- Myositis ossificans
- Gout
- Hyperparathyroidism
- Ochronosis
- Scleroderma/connective tissue disease
- Tumoral calcinosis
- Sarcoma (synovial cell)



SACRAL LESION

CAN

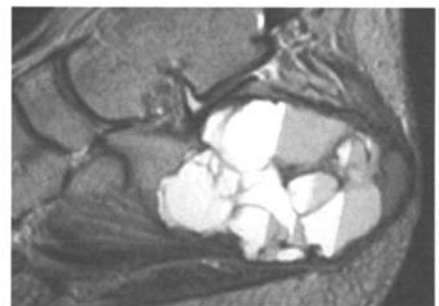
- Chondrosarcoma/Chordoma
- ABC/GCT
- Neurofibromatosis
- And always Mets/Myeloma/Lymphoma



FLUID-FLUID LEVEL

HOT MASS

- Hemangioma
- Telangiectatic osteosarcoma
- Metastasis
- ABC/GCT
- Synovial cell
- Sarcoma



Arthritis

INFLAMMATORY ARTHRITIS

1. RF+

Rheumatoid Arthritis

-Symmetric

SLE

-Subluxation/nonerosive

Scleroderma

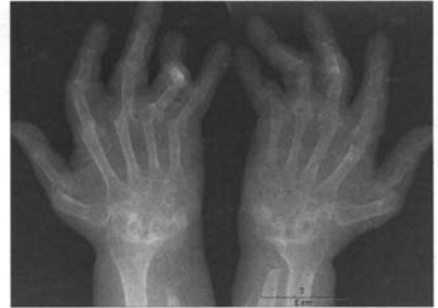
-DIP, PIP erosions

-Soft tissue Ca²⁺

-Acroosteolysis

Dermatomyositis

-Soft tissue Ca²⁺



2. RF-

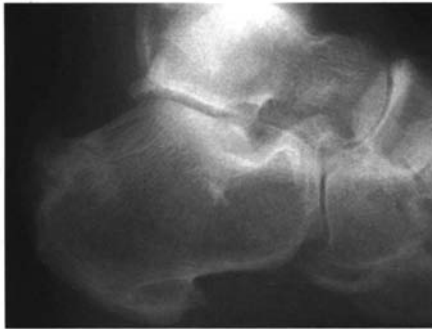
Ankylosing Spondylitis

- SI joint involvement



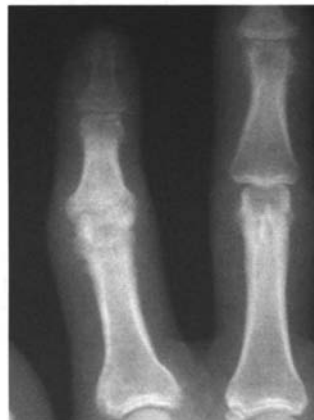
Reiters

- Foot > Hand
- Bony Proliferation



Psoriasis

- Erosive
- Bony proliferation
- Asymmetric
- Sausage digit
- Ivory phalanx
- Pencil in cup



Inflammatory Bowel Disease (IBD)

- Arthritis with IBD

3. EROSIVE OA

-Dip Joints



CRYSTAL ARTHRITIS

1. DEPOSITION

Gout

- Marginal erosions
- Overhanging edges
- Preserved joint space



CPPD

- ChondroCa²⁺
- Cysts
- 2nd and 3rd MCP
- SLAC
- TFCCa²⁺



2. OTHER

Hemochromatosis

Acromegaly

Other

Ochronosis

-Disc calcification

Multicentric reticular histiocytosis

-Symmetric

-No osteopenia

Infection

-Crosses Joint Space



OH MY GOD LESIONS

**VERY BIZARRE LOOKING GENERALIZED
LESIONS THAT YOU HAVE NO IDEA
WHAT IT IS, THINK OF:**

Paget disease
Fibrous dysplasia
Neurofibromatosis
Charcot joints

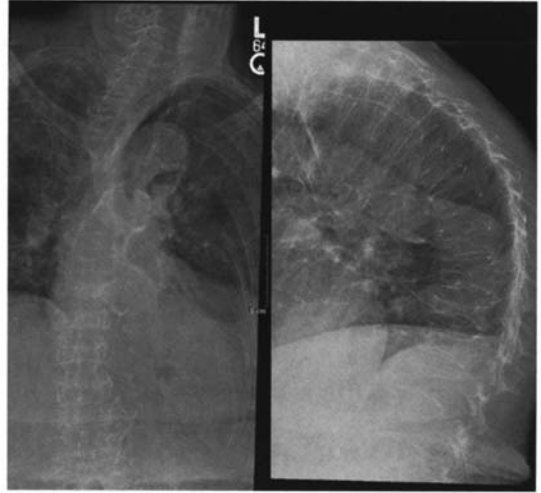


Metabolic

OSTEOPENIA

GENERALIZED

- Senile osteoporosis
- Osteomalacia
- Endocrine abnormalities
 - Cushings (too much)
 - Hypogonadism (too little)
- Anemia/Myelofibrosis/Gauchers
 - Bone marrow
- Congenital
 - Osteogenesis imperfecta
- Hyperparathyroidism



FOCAL

Reflex sympathetic dystrophy (complex regional pain syndrome)

Disuse

Transient osteoporosis

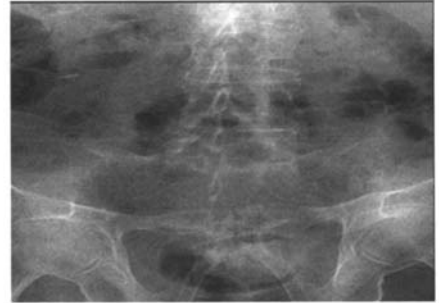
Migratory osteoporosis



SPINE

CALCIFICATION OF THE ANNULUS FIBROSUS

- Ankylosing spondylitis
 - Disks unremarkable
- Ochronosis
 - Disks calcified
 - Abn SI joints



OSTEOPHYTES

- DISH
 - Disks unremarkable
 - Normal SI joints



SYNDESMOPHYTES

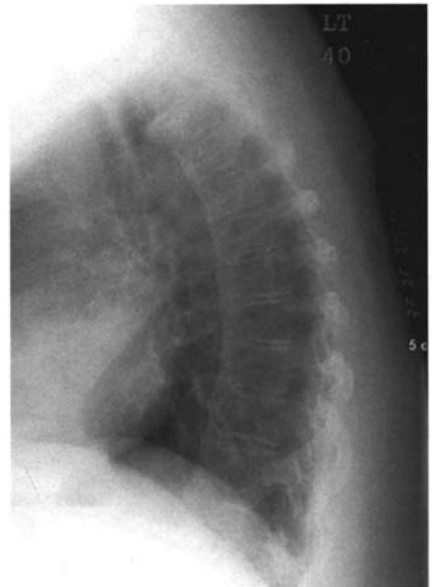
- Psoriasis
- Reiters



MARGINAL OSTEOPHYTES

- Spondylosis or degenerative

OSTEOPHYTOSIS



ARTHRITIS BASICS AND ARTHRITIS BY LOCATION

ABCDS Alignment
 Bone
 Cartilage/calcifications
 Distribution
 Soft tissues

Wrist

1st CMC, TFC—CPPD
 Radiocarpal joint—osteoarthritis
 CMC—gout (marginal erosions)

Hand

DIP + PIP

Osteoarthritis
 –Osteophytes
 –No erosions
 Erosive osteoarthritis
 –Osteophytes
 –Erosions
 –Females
 Psoriasis/Reiters
 –No osteophytes
 –Erosions

MCP + PIP

Rheumatoid
 –Erosions
 –No osteophytes
 –Osteopenia
 Psoriasis/Reiters
 –Erosion
 –Bony proliferation

MCP

Inflammatory
 –Erosions
 CPPD/hemochromatosis
 –Osteophytes

Foot

MTP JOINTS

RA
 Gout
 OA
 Neuropathic

MIDDLE/HINDFOOT

RA
 Osteoarthritis

Hip

BONY PROLIFERATION

OA
 –Superolateral migration
 Ankylosing spondylitis
 –Axial migration
 –SI joint involvement symmetric
 Psoriasis/Reiters
 –Axial migration
 –SI joint involvement asymmetric
 CPPD
 –Chondrocalcinosis

NO . PROLIFERATION

RA
 –Acetabular protrusio
 –Osteopenia

Knee**COMPLETE JOINT INVOLVEMENT****RA**

- No bony proliferation
- Osteopenia
- Cyst formation

JRA/hemophilia

- Wide femoral notch
- High density effusion

Psoriasis/Reiter's

- Asymmetric
- Bony proliferation

MEDIAL INVOLVEMENT

Osteoarthritis

PATELLOFEMORAL INVOLVEMENT

CPPD

Shoulder**GLENOHUMERAL JOINT****CPPD**

- vs osteoarthritis—not a weight-bearing joint

ACROMIOCLAVICULAR JOINT**Rotator cuff tear**

- Glenohumeral joint spared

TOTAL JOINT INVOLVEMENT**Rheumatoid**

- Symmetric

NORMAL JOINT SPACE

Hydroxyapatite crystal deposition disease

NAMES TO KNOW**UPPER EXTREMITY**

Mallet Finger
 Bennett's
 Rolando
 Gamekeeper
 Boxer's
 Colle's
 Smith's
 Chauffer's (Hutchinson's)
 Barton's
 Rev. Barton's
 Nightstick
 Monteggia
 Galeazzi
 Hill Sach's
 Bankart

LOWER EXTREMITY

Jones
 Lisfranc
 Choparts

 Maisonneuve

 Tillaux
 Wagstaffe-Lefort

SPINE

Jefferson
 Hangman
 Clay Shovelers
 Lefort I
 Lefort II
 Lefort III

LOCATION OF INJURY

Dorsal Base DP
 1st MC base, intraarticular
 Communitied
 1st PP ulnar
 5th MC
 Distal radius
 Reverse colles
 Radial styloid
 Dorsal rim
 Anterior rim
 Ulnar shaft isolated
 Ulna and radial + dislocation (elbow)
 Ulna and radial + dislocation (wrist)
 Humeral head
 Glenoid

LOCATION OF INJURY

5th MT base
 2-5 MT
 Talonavicular and calcaneocuboid
 dislocation
 Pronation external rotation injury-
 proximal fibula
 Anterior tibial tubercle
 Fibular avulsion

LOCATION OF INJURY

C1 lateral masses
 C2 pars Fx
 Posterior elements
 Through maxilla
 Nasal—inferior orbital rims
 Nasal—orbits

2

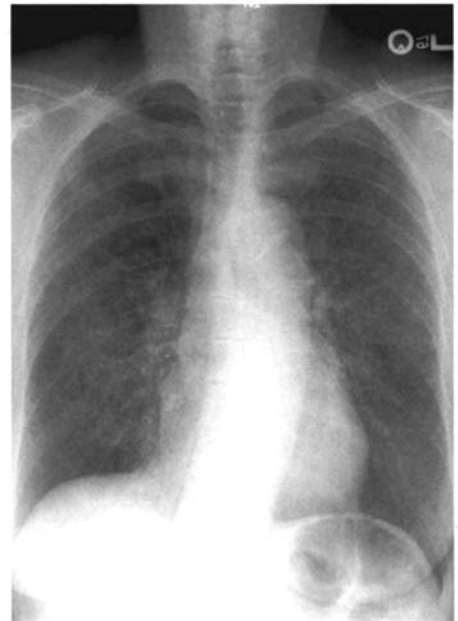
Chest Radiology

Includes plain film diagnosis, CT, MRI, and interventional techniques used in the diagnosis of diseases of the lungs, pleura, and mediastinum including the heart and great vessels.

LYMPHANGITIC CARCINOMATOSIS

“CERTAIN CANCERS SPREAD BY PLUGGING THE LYMPHATICS”

Cervix
Colon
Stomach
Breast
Pancreas
Thyroid
Larynx

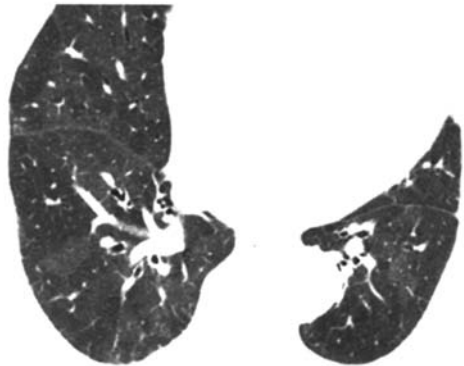
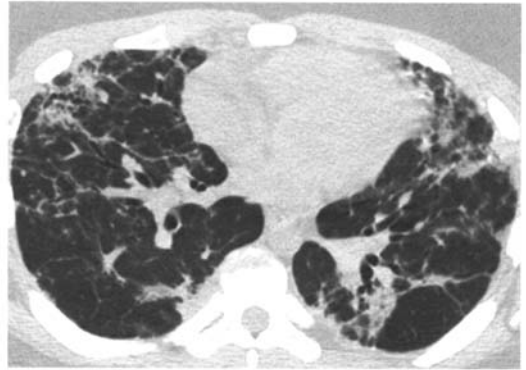


From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

BRONCHIOLITIS OBLITERANS

CRITTERS

COP/BOOP
 Rheumatoid
 Infectious-Swyer James
 Transplant
 Toxins
 Sarcoid



MULTIPLE NODULES OR MASS >3 CM

DAYS OF THE WEEK: MTWTFSS

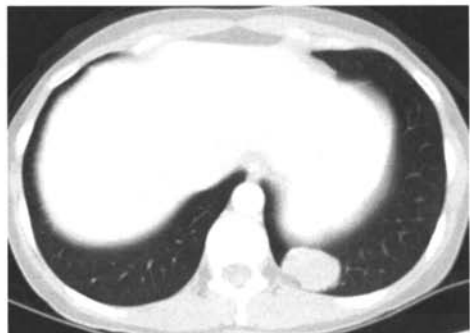
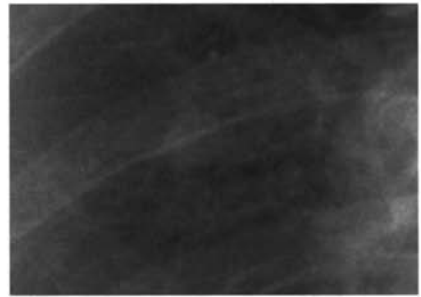
Mets/Carcinoma/Lymphoma
 TB/granuloma
 Wegeners
 Rheumatoid nodules/Round pneumonia
 Fungal
 Sarcoid
 Septic pulmonary emboli



COIN LESION <3 CM

CHANGE

- Carcinoma/Congenital
- Hamartoma/Hematoma
- AVM/Abscess
- Neoplasm–mets
- Granuoma
- Esoteric-TB pneumonia



A CT scan should be done to assess:

Ca²⁺ pattern

Benign: solid, lamellated, central

Malignant: stippled, any other pattern.

Density: fat - Hamartoma

Margins:

Spiculated suggestive of carcinoma

Enhancement

Four 1-min images >15HU suggestive

Growth

CAVITY

CAVITY

Carcinoma-SCC

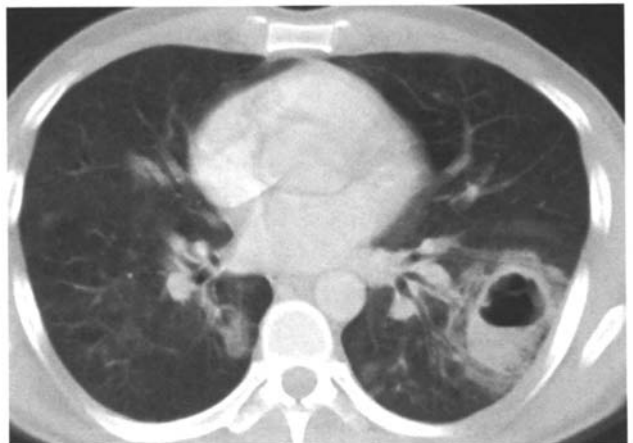
Abscess-fungal/bacterial/TB

Vascular-septic emboli

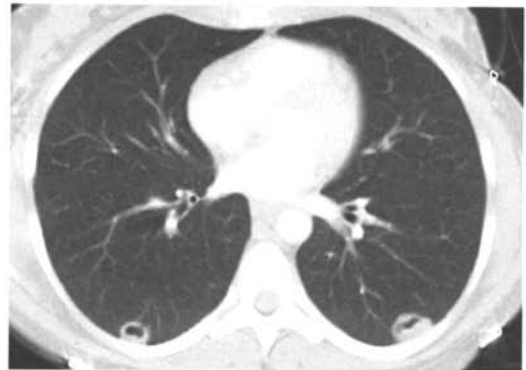
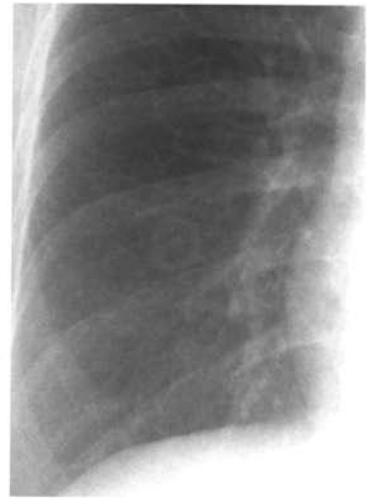
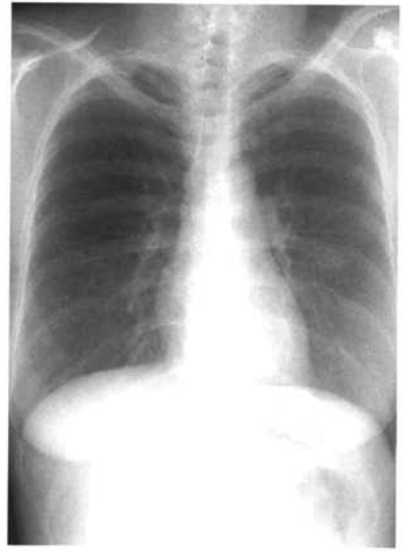
Inflammatory-rheumatoid nodule

Trauma-resolving contusion

Young-bronchogenic cyst



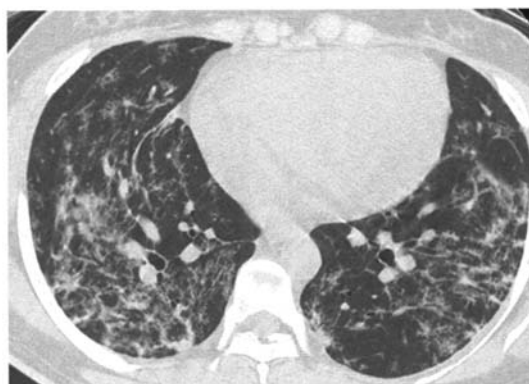
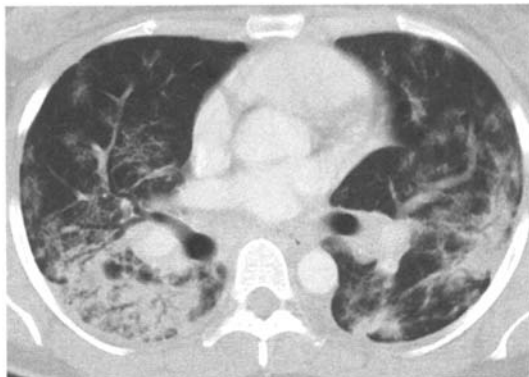
CAVITY (continued)



BRONCHOVASCULAR SPREAD

SKILL

Sarcoid
Kaposi
Infection-PCP/TB
Lymphoma
Lymphagitic spread



UNILATERAL HYPERLUCENT LUNG

POEMS

Poland syndrome/Pneumothorax
Oligemia/Obstruction (PE)
Emphysema
Mastectomy
Swyer James



ACUTE INTERSTITIAL DISEASE (RETICULAR)

HELP

- Hypersensitivity pneumonitis
- Edema-Inhalation injuries
- Lymphoproliferative
- Pneumonia-atypicals, PCP

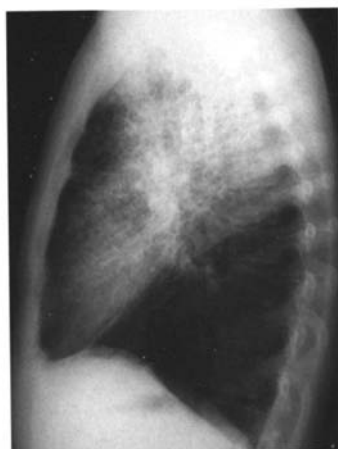


CHRONIC INTERSTITIAL DISEASE (RETICULAR)

PAGE CHUCK AT THE CIA RIGHT NOW, THERE'S DRUGS

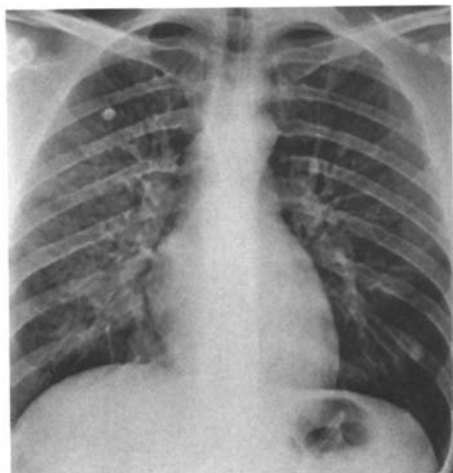
UPPER LUNG ZONES

- Pneumoconiosis
- Ankylosing spondylitis
- Granulomatous
- Eosinophilic
- Sarcoid/Silicosis



MID LUNG ZONES

- Chronic Hypersensitivity



LOWER LUNG ZONES

Collagen vascular disease

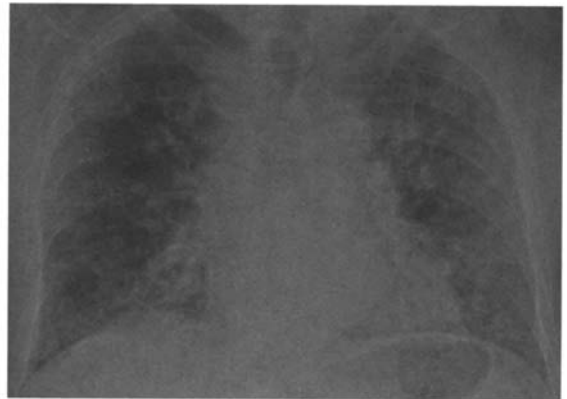
IPF

Asbestos

Rheumatoid

NF

Drug toxicity

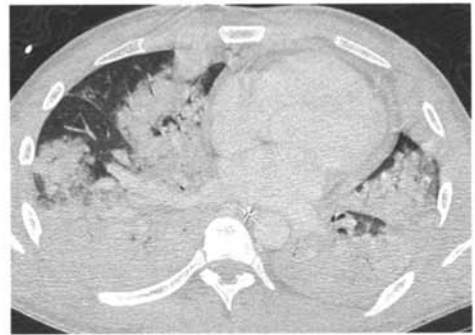
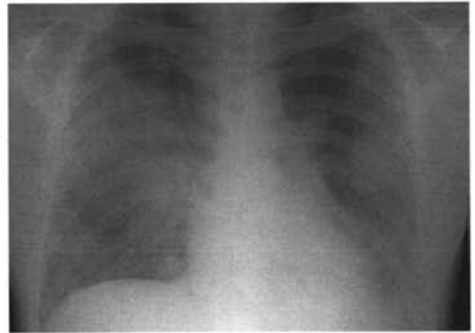


ACUTE AIRSPACE DISEASE

HELP LEGALIZE HEMP

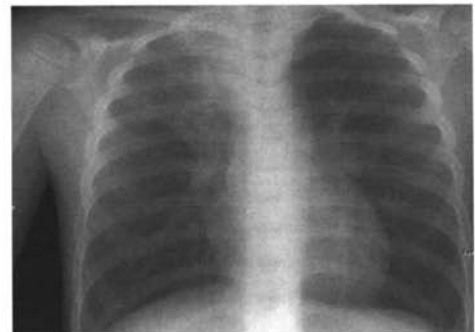
DIFFUSE

- Hemorrhage
- Edema
- Lymphoproliferative—esoteric
- Pneumonia



FOCAL

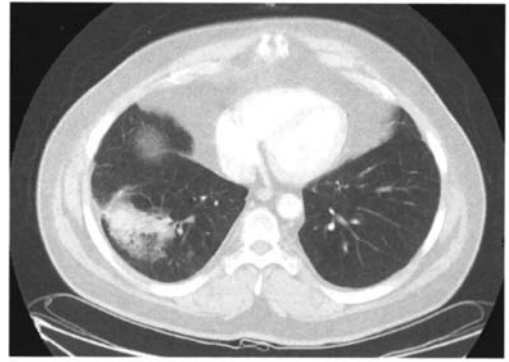
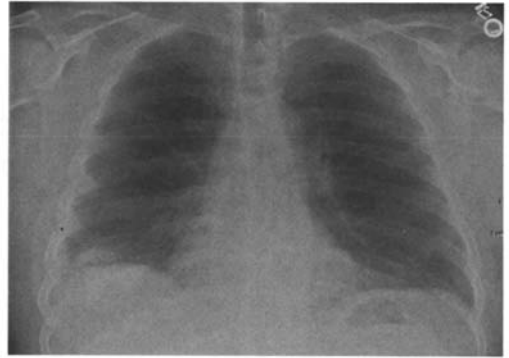
- Hemorrhage-contusion/PE
- Edema-inhalation (crack)
- MI (RUL)
- Pneumonia



CHRONIC AIRSPACE DISEASE

PEBBLES

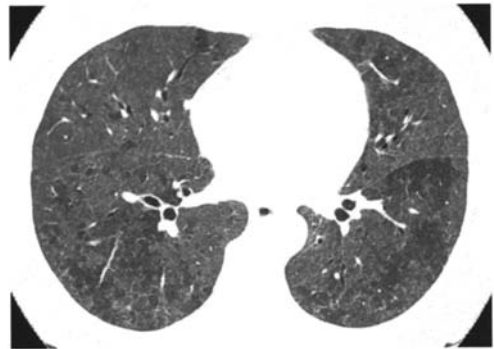
- PAP/PCP/Pedema
- Eosinophilic pneumonia
- BAC
- BOOP
- Lymphoma
- Esoteric-Wegener's/TB
- Sarcoid/Septic pulmonary emboli



GROUND GLASS DIFFUSE OPACITY

SHAKE YOUR HIPS IN BED

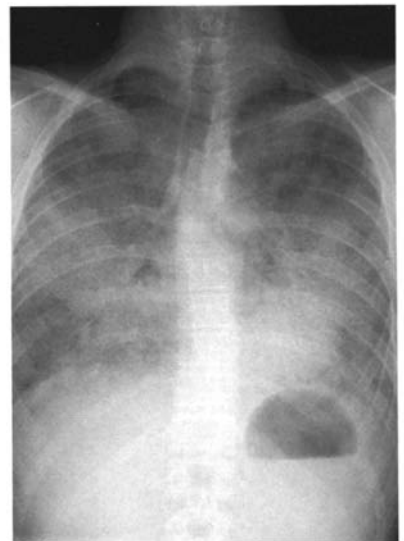
- Sarcoid
- Hypersensitivity — smokers
- Infection
- Pneumonitis — DIP
- Scleroderma/CVD
- BOOP
- Edema/aspiration
- Drug toxicity



CENTRAL OPACITIES EXTENDING FROM THE HILA OUTWARDS

PPPP

- PAP
- Pulmonary edema
- PCP
- Pneumonia — atypical/influenza



MIDDLE MEDIASTINAL MASS

HABIT

Hernia, Hematoma

Aneurysm

Bronchogenic cyst/duplication cyst

Inflammation (sarcoidosis, histoplasmosis, coccid-
ioidomycosis, primary TB in children)

Tumors—remember the five Ls:

Lung, especially oat cell

Lymphoma

Leukemia

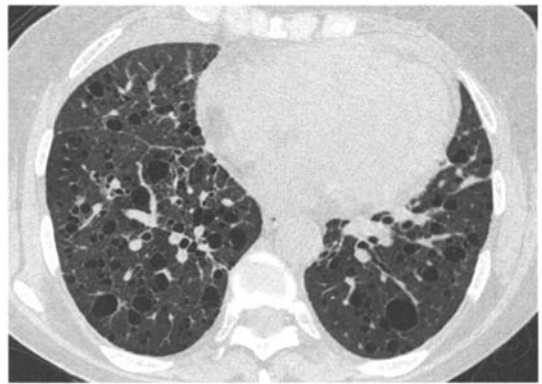
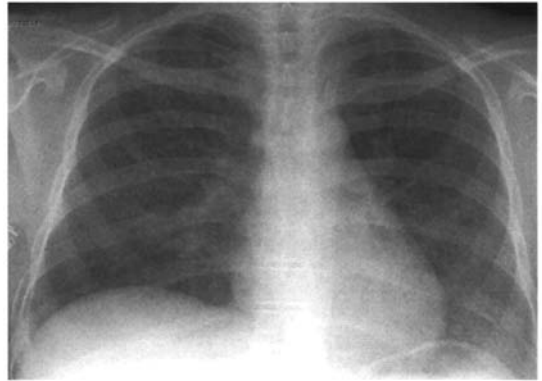
Leiomyoma

Lymph node hyperplasia



RETICULAR (CXR)/CYSTIC OPACITIES (CT)**ELECT CHIP**

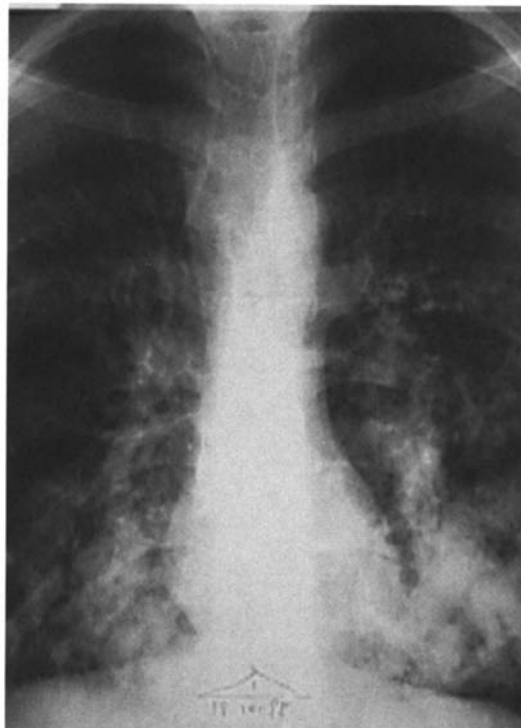
EG
LAM
Emphysema
CF
TS
Coccidiomycosis
Hydrocarbon
Infectious
PCP



FINGER IN GLOVE OPACITIES

CACACA

- CF
- Asthma
- Congenital bronchial atresia
- ABPA
- Cancer
- AVM



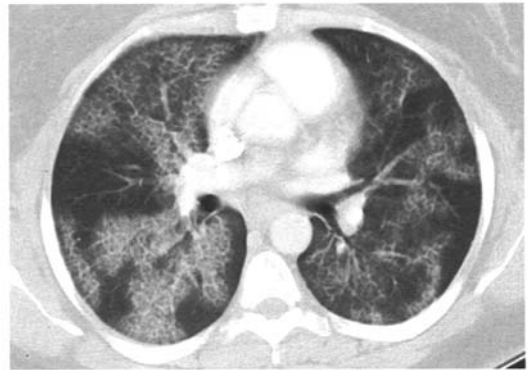
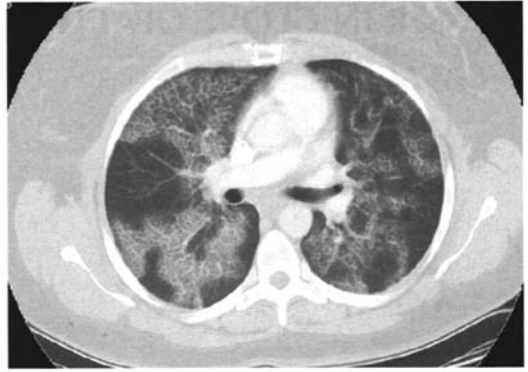
CRAZY PAVING (CT)

ACUTE

- Edema
- Hemorrhage

CHRONIC

- PAP
- Sarcoid
- PCP
- Fibrosis



END-STAGE LUNG (CXR)— ARCHITECTURAL DESTRUCTION

TESSA

TB

EG

Sarcoid

Silicosis

ARDS—The sequela of



CA²⁺ NODULES

MASH POX

- Metastatic disease
- Alveolar microlithiasis
- Silicosis/siderosis
- Histoplasmosis
- Pox** (Varicella)



TREE IN BUD OPACITIES (CT)

MIT

- Mucous plugging: Aspiration/Kartagener's
- Inflammatory plugging (PUS): TB/MAI
- Tumor emboli (rare)

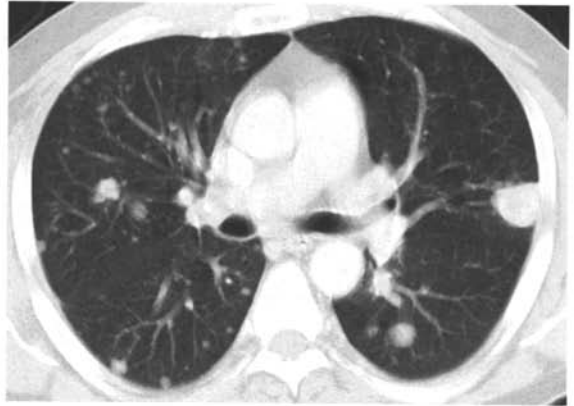


NODULES (CT)

DIFFUSE

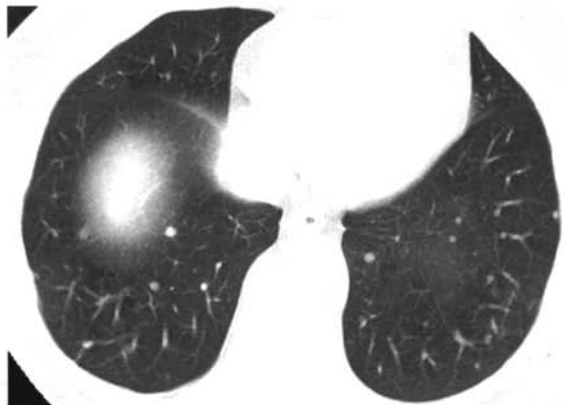
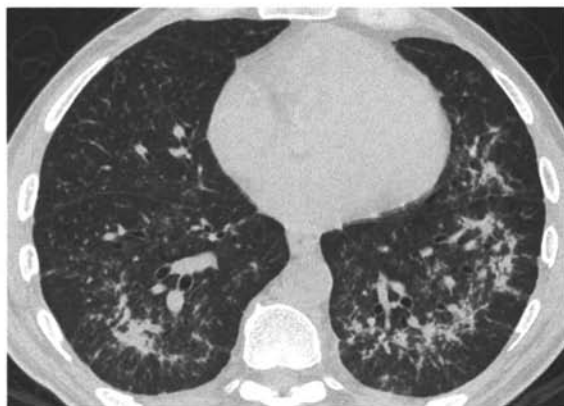
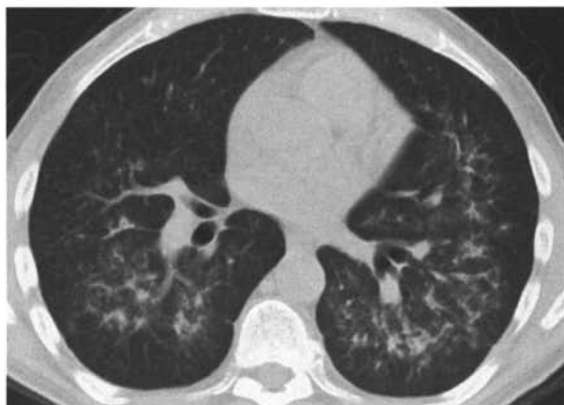
MISSLE

- Mets
- Infection
- Sarcoid
- Silicosis
- Lymphoma
- EG



PERILYMPHATIC**A SKILL**

- Amyloid
- Sarcoid
- Kaposi's
- Infection (PCP)
- Lymphoma
- Lymphang carcinomatosis



CENTRIOLOBULAR

HERB HAS GAS

Hypersens pneumonitis

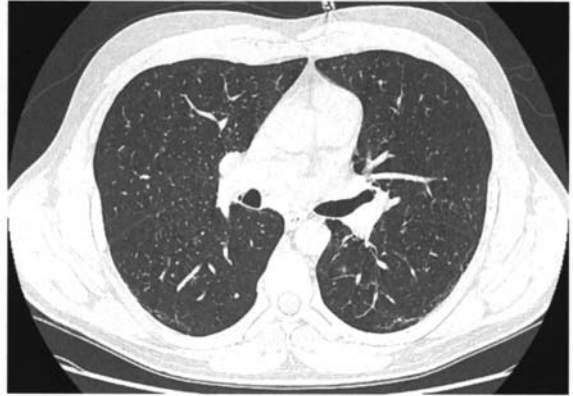
EG

RB-ILD

BAC/BOOP

GVHD

VASculitis



BRONCHIECTASIS

CAPT KANGAROO HAS MOUNIER KUHN

Cystic fibrosis
ABPA
Postinfectious
TB
Kartagener's
Mounier Kuhn



TRACHEAL NEOPLASMS

Multiple

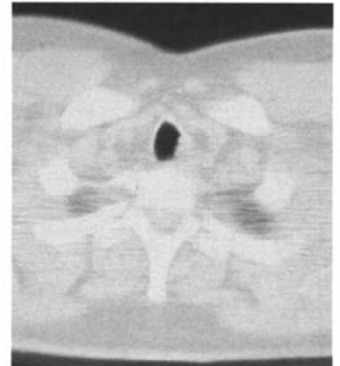
TRAM

- Tracheobronchopathia
- Relapsing polychondritis
- Metsastasis

Single

MATCH

- Mucoepidermoid
- Adenoid cystic
- Tracheal SCC
- Carcinoid
- Hamartoma



Cardiac

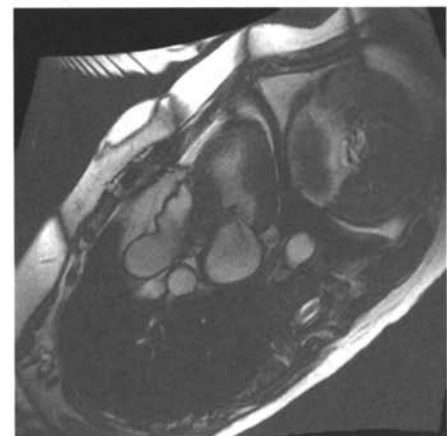
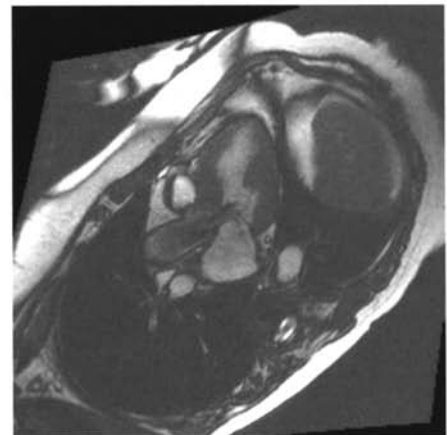
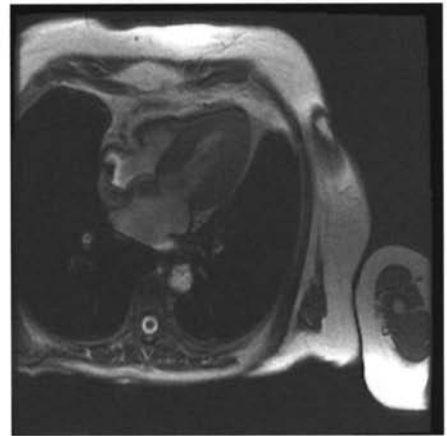
CARDIOMYOPATHY

RESTRICTIVE

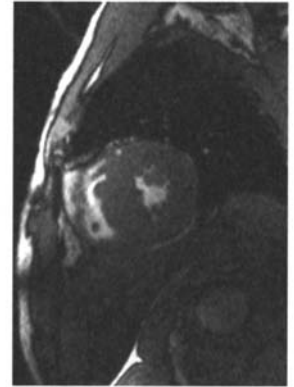
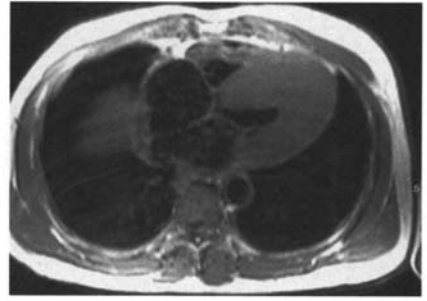
- Sarcoid
- Hemochromatosis
- Amyloid
- Endocardial fibroelastosis

HYPERTROPHIC

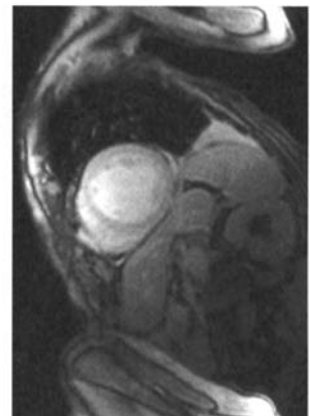
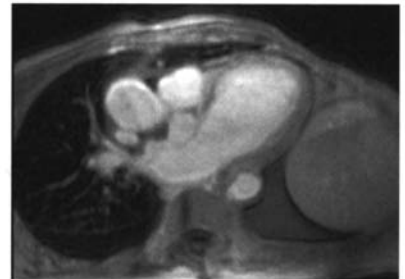
- Obstructive
- Nonobstructive



Dilated

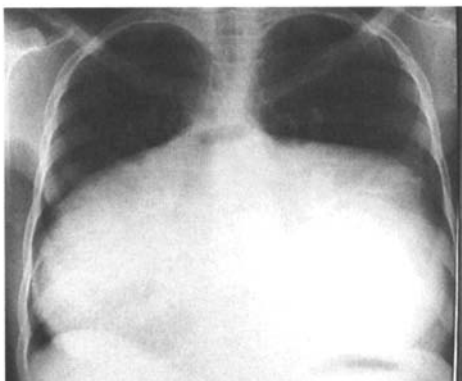


PERICARDIUM



CA²⁺

- Uremic
- Viral
- TB
- Prior hemorrhage



3

Gastrointestinal Radiology

Includes plain radiograph interpretation, contrast studies of the GI tract and abdominal imaging studies including CT, MRI, and ultrasound, plus interventional techniques related to the esophagus, stomach, small and large intestines, biliary tract, liver, spleen, pancreas, peritoneal cavity, and abdominal wall.

GENERAL

1. The Gastrointestinal Mantra: Always consider the three following categories in the GI tract, almost all cases shown will encompass:

- a. Neoplasm
- b. Infection
- c. Inflammatory

**2. In GI, when all else fails, think: TB, CROHN'S, LYMPHOMA, METS.
It will save you 90% of the time.**

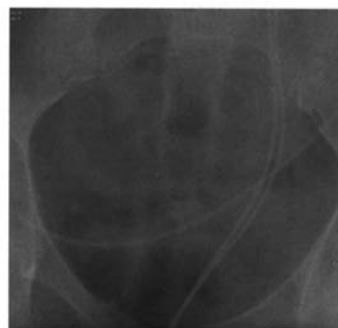
PLAIN FILM

HAVE A SYSTEMATIC APPROACH ON THE BOARDS. It goes quickly so you must do this on all films.

"ABCD"

AIR (MISSING THESE = FAIL)

1. Portal vein
2. Emphysematous cholecystitis
3. Emphysematous pyelonephritis
4. Emphysematous cystitis
5. Retroperitoneal air
6. Free air
7. Pneumatosis



BOWEL

- Pattern
- Location
- Hernia



CALCIUM

- Gallbladder
- Renal
- Appendix
- Bladder
- Aneurysms



DEM BONES

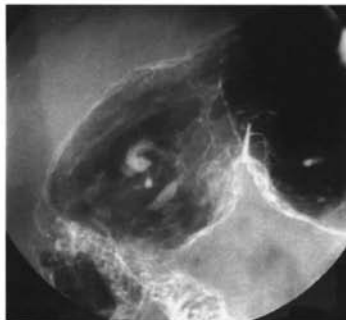
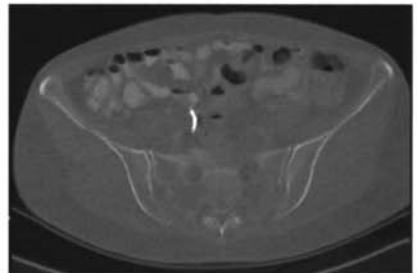
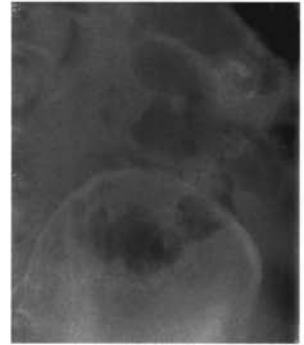
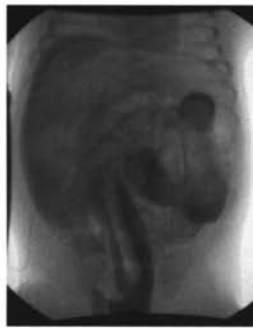
Lytic pedicles will signify RCC on board exams.



ABNORMAL COLLECTION OF BARIUM ANYWHERE

FED UP

- Fistula
- Extravasation
- Diverticulum
- Ulcer
- Perforation



Esophagus

MASS

CALL the MVP

- Carcinoma
- Adenoma/Polyp/Papilloma
- Lymphoma
- Leiomyoma
- Metastasis
- Varices
- Papilloma



ULCERATION/STRICTURE

CAR RIMS

- Caustic or NG/Crohn's
- Adenocarcinoma
- Reflux
- Radiation
- Infection/inflammatory
- Metastasis
- Skin – Bullous/Pemphigus



ESOPHAGEAL FILLING DEFECTS

Candida

Glycogenic Acanthosis/Acanthosis Nigricans

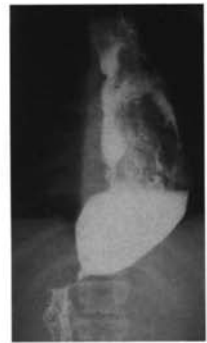
Leukoplakia



ESOPHAGEAL MOTILITY DISORDER

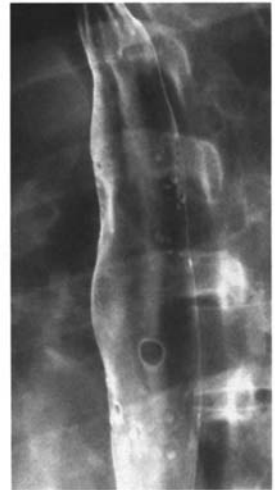
PRIMARY

Achalasia
Nonspec Esop Motility Dz
Presbyesophagus
DES



SECONDARY

- Scleroderma
- Diabetes
- Infection-Chagas
- Esophagitis-reflux/radiation



DIVERTICULI

High

PULSION-Zenker's



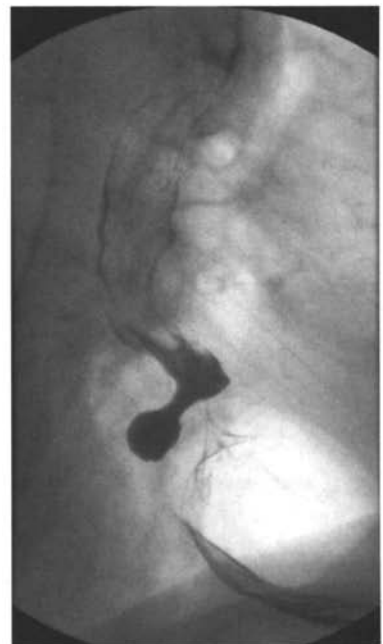
Mid

TRACTION-TB/Histoplasmosis



Low

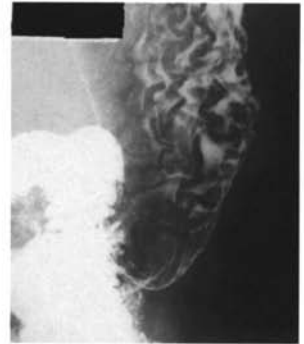
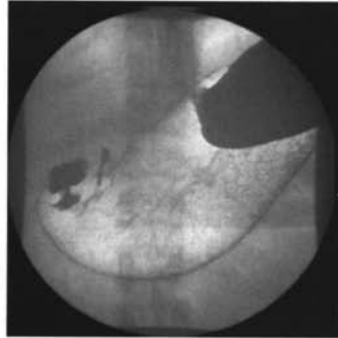
EPIPHRENIC



Stomach

GASTRITIS

Fold Thickening



GASTRIC ULCERS

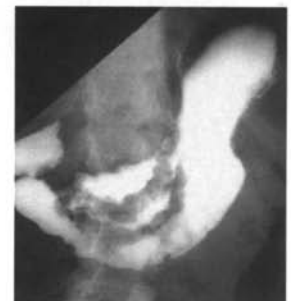
Benign

- Thin folds
- Beyond lumen
- Eccentric crater
- + Hampton
- N Peristalsis



Malignant

- Thick fold
- Within lumen
- Central crater
- Hampton
- Abn Peristalsis



APTHOUS ULCERS

ACHE BABY

ASA/meds

Crohn's

Herpes

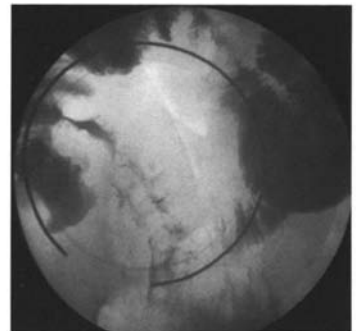
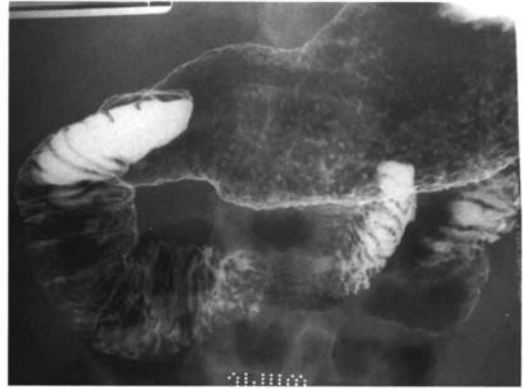
ETOH

Behcet

Amebiasis

Bad AIDS

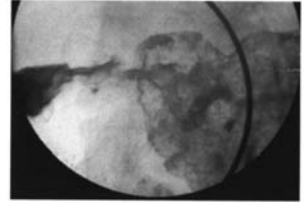
Yersenia



ANTRAL NARROWING

CTL SPINE (AS IN CTL: CERVICAL/THORACIC/LUMBAR)

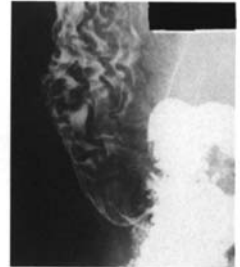
- Crohn's
- TB
- Lymphoma/carcinoma/mets
- Sarcoid
- Prior ulcer/Atrophic gastritis
- Ingestion (caustic)
- Eosinophilic gastroenteritis
- Chronic granulomatous dz childhood (Pediatrics only-for the 72)



FOLD THICKENING

LAMAZE CLASSES

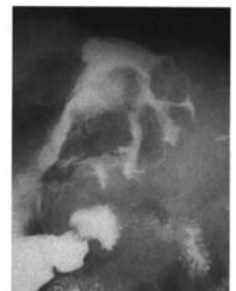
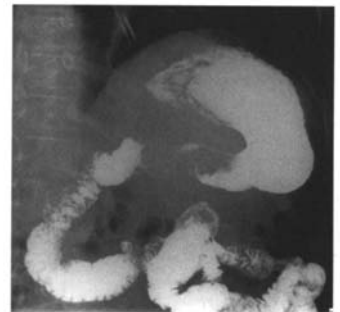
- Lymphoma
- Adenocarcinoma
- Menetriers
- Zollinger Ellison
- Eosinophilic gastritis

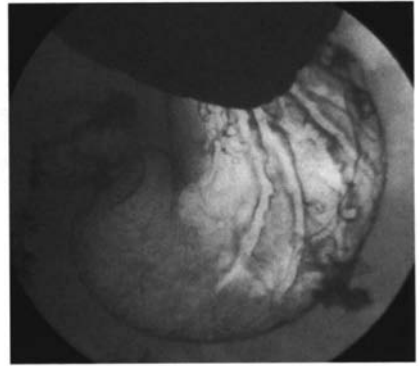


GASTRIC MASS

CALL ME

- Carcinoma
- Adenoma/Hyperplastic polyps
- Lymphoma
- Leiomyoma/Lipoma
- MEtastasis



CALL ME (continued)**LINITIS PLASTICA****GRAM STAIN**

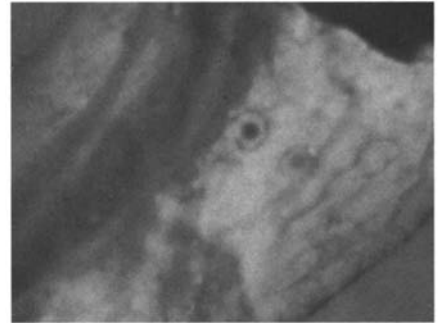
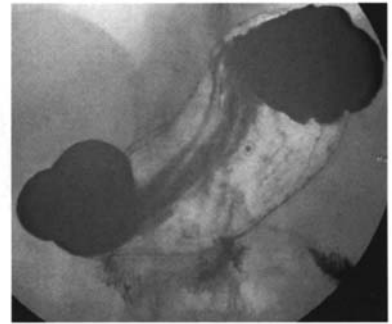
- Granulomatous infection
(TB)/Crohn's/Lymphoma
- Radiation
- Adenocarcinoma
- Metastasis-breast



BULLSEYE/TARGET LESION

BLACK

- Breast metastasis/Melanoma metastasis
- Leiomyoma
- Adenocarcinoma
- Cancer-lymphoma
- Kaposi



DOUBLE CHANNEL PYLORUS

ULCER

- Ulcer disease
- Lymphoma
- Crohn's
- Endoscopy induced injury
- Radiation



Duodenum

ANTRAL/DUODENAL FILLING DEFECTS

BLED

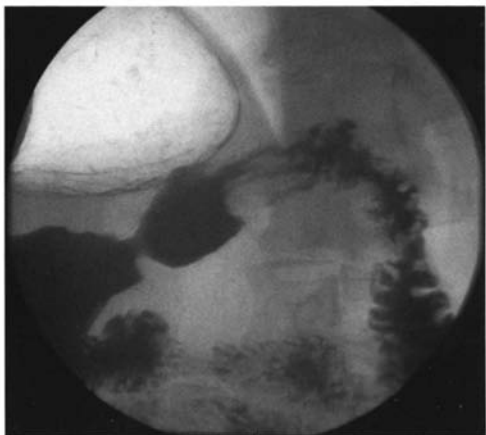
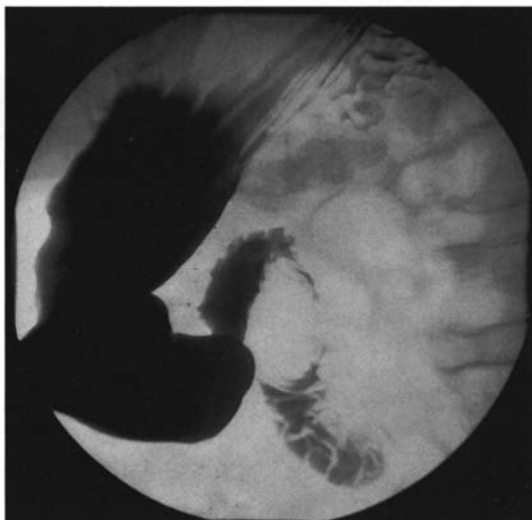
- Brunner's gland hyperplasia
- Lymphoid hyperplasia
- Ectopic gastric mucosa
- Duodenitis



BULBAR MASS

ABCDE

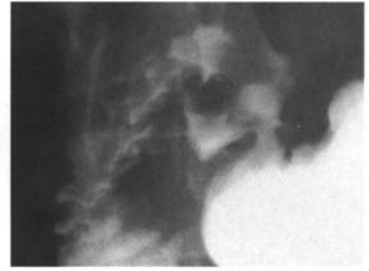
- Ampulla
- Brunner's gland adenoma
- Crohn's
- Duodenal adenocarcinoma
- Ectopic pancreas



DUODENAL ULCER

PAT

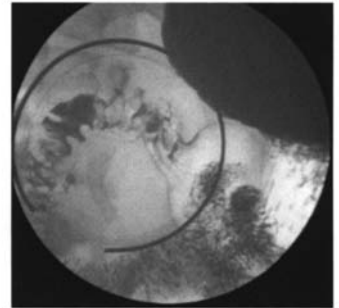
- Peptic ulcer
- Adenocarcinoma
- TB/Crohn's/Lymphoma



DUODENAL FOLD THICKENING

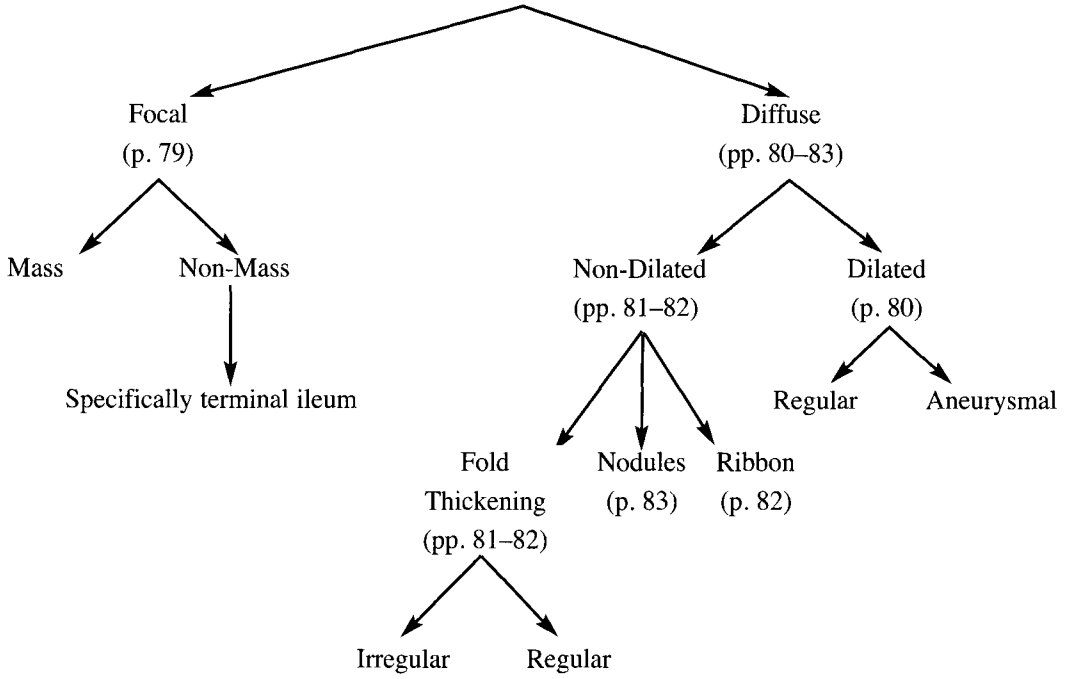
PAD LOCZS

- PAⁿcreatitis
- Duodenitis-ETOH/meds
- LymphOma
- Cystic Fibrosis/Crohn's
- Zollinger Ellison
- Sprue/strongyloides



Small Bowel

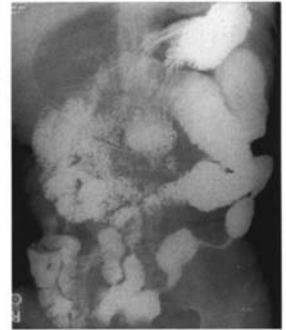
APPROACH TO SMALL BOWEL



FOCAL PROCESS

ANYWHERE

- Ischemia
- Crohn's
- Neoplasm
- Radiation

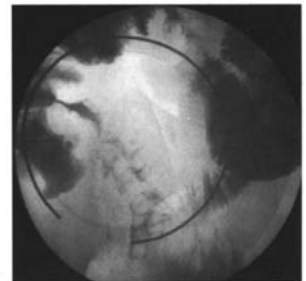


TERMINAL ILEUM (exclude appendix and cecal processes)

- TB
- Crohn's
- Lymphoma
- Mets
- Infection (specific to the TI)

Your S Smells Totally Awful

- Yersinia
- Shigella
- Salmonella
- TB
- Actinomycosis



DIFFUSE

SMALL BOWEL

Dilated

SOS

- Sprue
- Obstruction
- Scleroderma

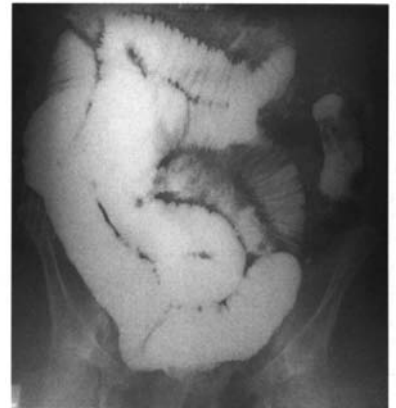
OR

Wet Pattern

- Sprue
- Zollinger Ellison
- Lymphoma

Dry Pattern

- Obstruction
- Scleroderma
- Radiation



SMALL BOWEL

Aneurysmal Dilatation

MALL

- Metastasis
- Abscess/Hematoma
- Lymphoma
- Leiomyosarcoma

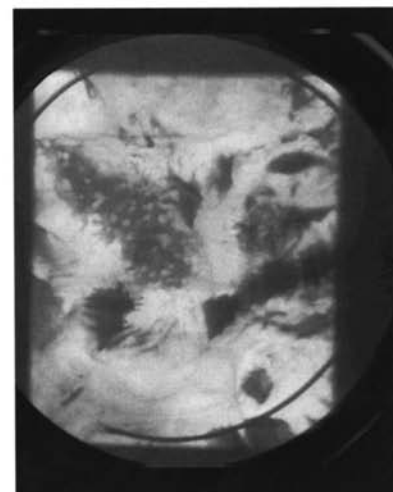
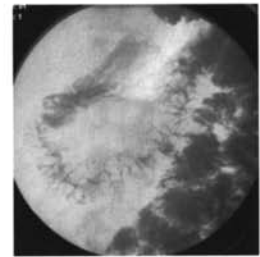
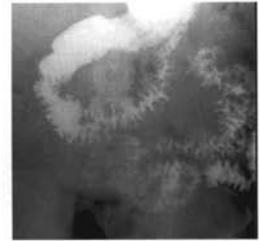


SMALL BOWEL FOLDS

Irregular Thickening

MALE COW

- MAI
- Amyloid
- Lymphoma
- Eosinophilic Gastroenteritis
- Crohn's
- Other-Giardiasis
- Whipple



SMALL BOWEL FOLDS***Regular Thickened "Picket Fence"*****HEMORRHAGE**

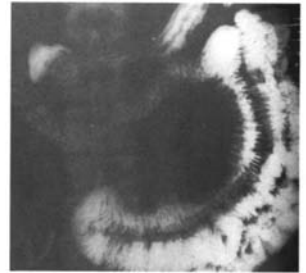
- HSP
- Anticoagulation

EDEMA

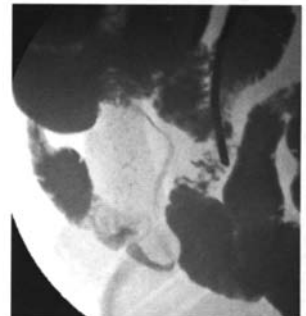
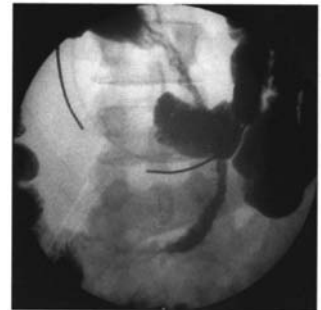
- CHF
- Hypoproteinemia

OTHER

- Lymphoma
- Lymphagectasia
- Radiation

**SSMALL BOWEL*****Ribbon Bowel*****A CUTE GIRL**

- Amyloid
- Cryptosporidiosis
- GVHD
- Ischemia/Infection
- Radiation
- Lymphoma

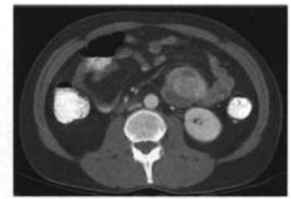


SMALL BOWEL

Masses

LACK

- Leiomyoma
- Adenocarcinoma
- Carcinoid
- Kaposi

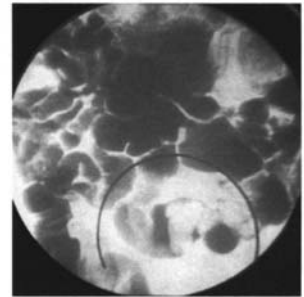


SMALL BOWEL

Nodules

MACE KILLS

- Mastocytosis/Macroglobunemia
- Amyloid
- Crohn's
- Eosinophilic enteritis
- Kaposi

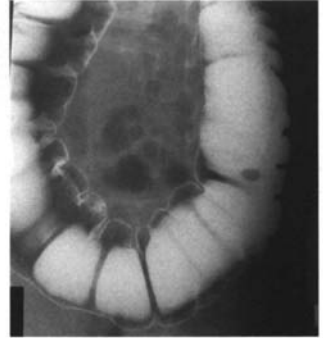


Colon

POLYPS

SINGLE

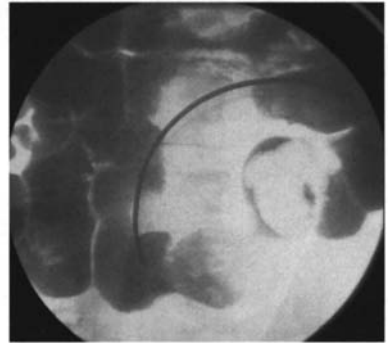
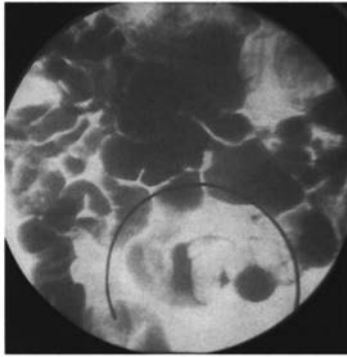
- Hamartomatous
- Adenoma-tubular/tubulovillous/villous
- Hyperplastic
- Lymphoma
- Inflammatory-UC/Crohn's



MULTIPLE/POLYPOSIS

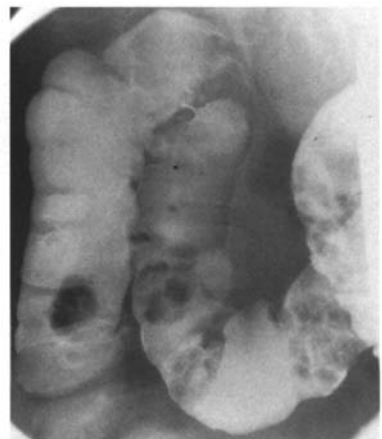
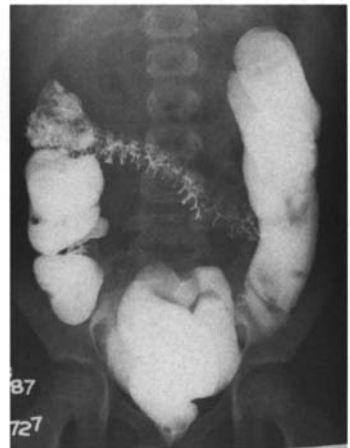
1. Hamartomas

Peutz-Jaeger: (MUCOCUTANEOUS)

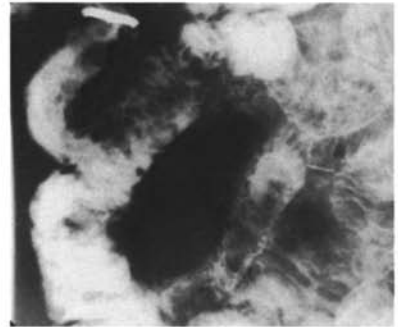


2. Hyperplastic

Juvenile Polyposis (Children are **HYP**ER)



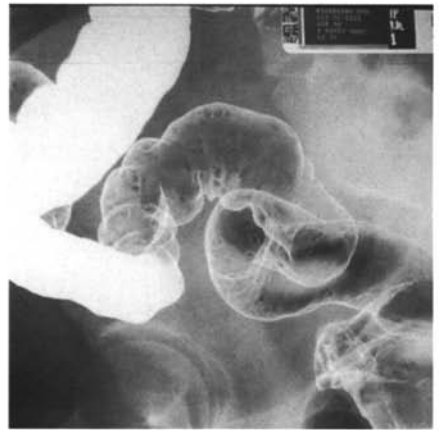
Cronkhite Canada:
(CHECK STOMACH FOR POLYPS)



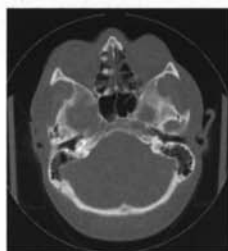
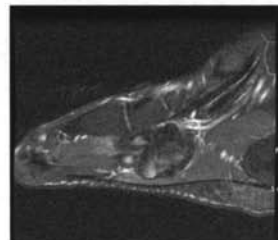
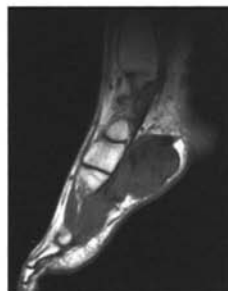
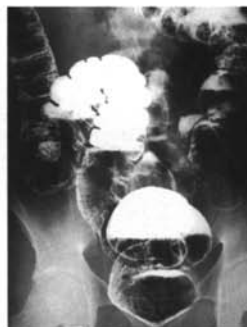
3. Adenomatous

FiGhT

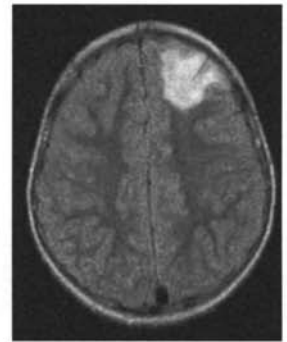
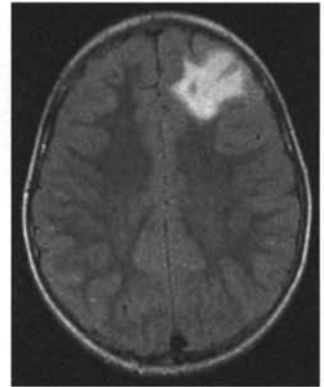
Familial Polyposis



Gardner's



Turcot



SPICULATED SEROSA

SEARS Credit Card

- Serosal mets
- Endometriosis
- Abscess/Adhesion
- Radiation
- Swallowed foreign body
- Crohn's
- Carcinoid



PNEUMATOSIS

CHIPS

- COPD
- Ischemia
- Pneumatosis cystoides intestinalis
- Scleroderma/Steroids



SACCULATIONS

MISC

- Mets
- Ischemia
- Scleroderma
- Crohn's



BALD COLON

I Use Radioactive Laxatives

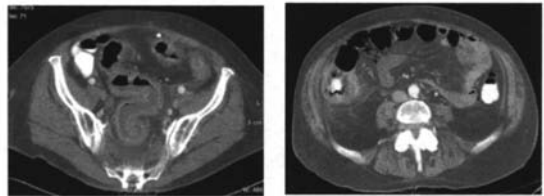
- Ischemia
- Ulcerative colitis
- Radiation
- Laxatives
- Scleroderma



GENERALIZED COLITIS

IPNR

- Infectious-E. coli/CMV
- Inflammatory-Pseudom, Crohn's/UC
- Ischemic -A. fib etc.
- Neoplastic-lymphoma
- Radiation



FOCAL COLITIS

CECUM-

ABC

- Amebiasis
- Blastomycosis
- CMV



RIGHT COLON-

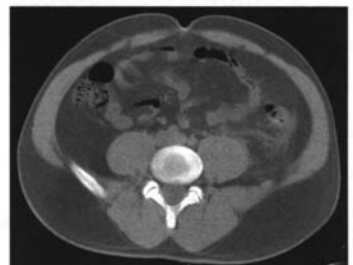
- Typhlitis, salmonella, shigella, TB, Diverticular bleed

TRANSVERSE-

- Pseudomembranous/CMV/E. coli
- Pancreatitis/Stomach

LEFT COLON-

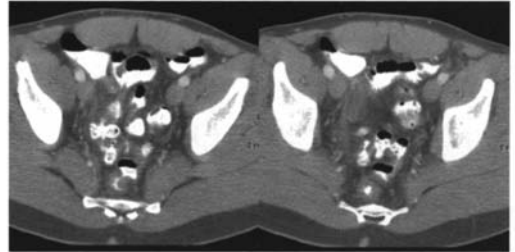
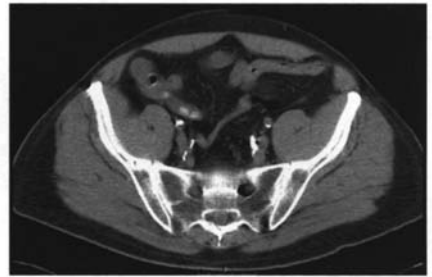
- Diverticulitis/CA
- Ischemia at flexure
- RCC



APPENDIX

INC

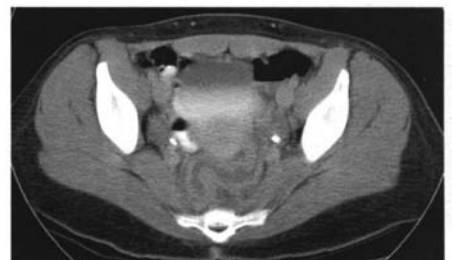
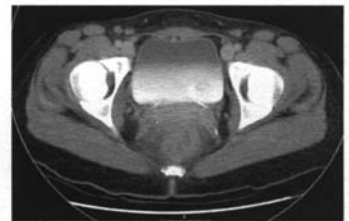
- Infection
- Neoplasm
 - Cystadenocarcinoma
 - Mucocele
- Carcinoid



RECTUM

CLOGGED

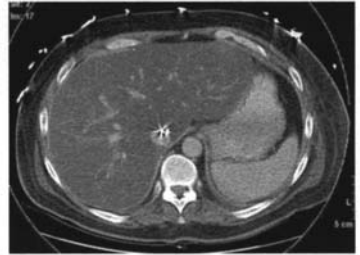
- Chlamydia
- Lymphogranulomatous venerum
- Gonococcus



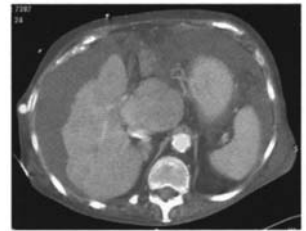
Liver

IN GENERAL:

1. Fatty or not? Always a favorite question



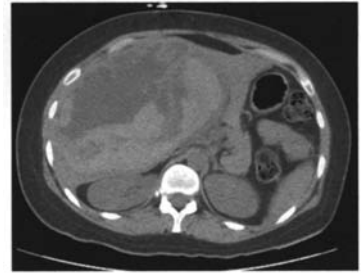
2. Cirrhotic or not? Makes one think of HCC every time



3. Portal vein—open or not? Consider HCC



DIFFUSE	FOCAL
<p>Neoplasm</p> <ul style="list-style-type: none"> • HCC • Cholangiocarcinoma • Lymphoma 	<p>Neoplasm</p> <p>“LIVER CELL”</p> <ul style="list-style-type: none"> • Benign <ul style="list-style-type: none"> – Adenoma – FNH • Malignant <ul style="list-style-type: none"> – HCC – Fibrolamellar – Metastasis <p>“BILE CELL”</p> <ul style="list-style-type: none"> • Benign <ul style="list-style-type: none"> – Cystadenoma • Malignant <ul style="list-style-type: none"> – Cystadenocarcinoma <p>“MESENCHYMAL”</p> <ul style="list-style-type: none"> • Benign <ul style="list-style-type: none"> – Hemangioma • Malignant <ul style="list-style-type: none"> – Lymphoma
<p>Infectious</p> <ul style="list-style-type: none"> • Hepatitis 	<p>Infectious</p> <ul style="list-style-type: none"> • Abscess
<p>Inflammatory</p> <ul style="list-style-type: none"> • Cirrhosis 	
<p>Other</p> <ul style="list-style-type: none"> • Glycogen storage • Hemochromatosis • Fatty 	
<p>Vascular</p> <ul style="list-style-type: none"> • Pre-Sinusoidal <ul style="list-style-type: none"> – Schistosomiasis – Cirrhosis • Post Sinusoidal <ul style="list-style-type: none"> – Budd Chiari – CHF 	



IMAGES

*Diffuse
Neoplasm
HCC*



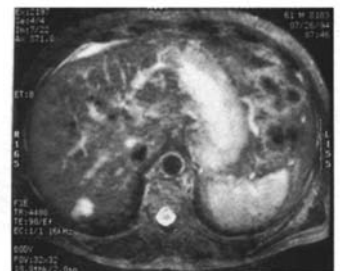
*Focal
Neoplasm
"Liver cell"*



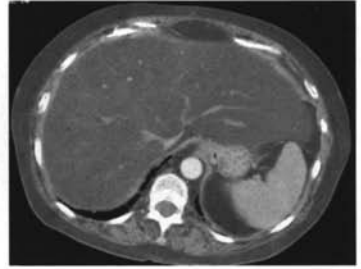
*Focal
Neoplasm
"Bile cell"*



*Focal
Neoplasm
"Mesenchymal"*



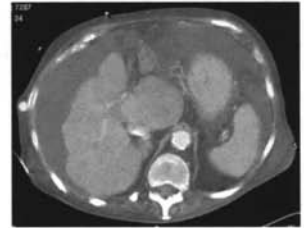
*Diffuse
Infectious*



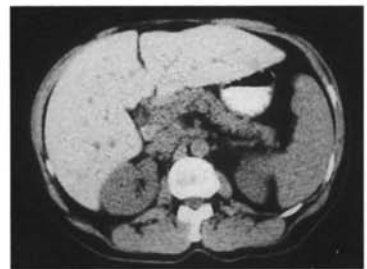
*Focal
Infectious*



*Diffuse
Inflammatory*



*Diffuse
Other*



*Diffuse
Vascular*



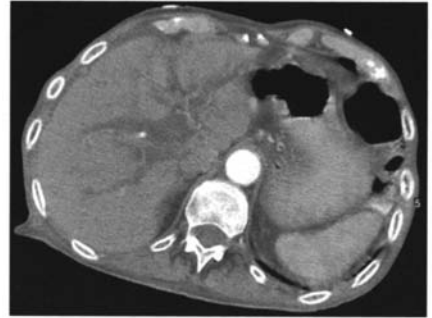
BILE DUCT DILITATION

High

- HIV
- PSC
- Cholangiocarcinoma

Confluence

- Metastatic lymph nodes
- Klatskin
- HCC
- GB



Low

- GB
- Mirizzi
- Post-instrumentation stricture
- HCC

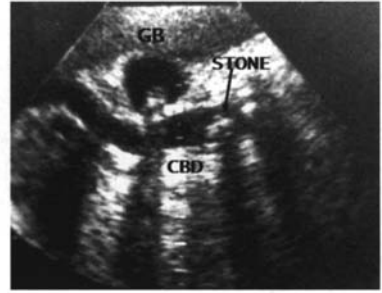


Ampulla

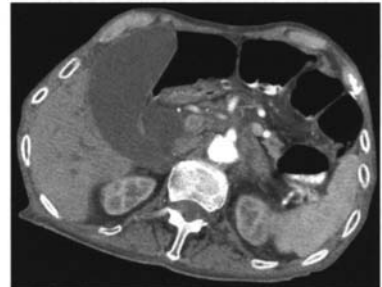
- Panc CA



Stone



Cholangiocarcinoma



BILE DUCT WALL THICKENING

PAC-SAC

- Pancreatitis
- Ascending cholangitis
- Cholangiocarcinoma
- Sclerosing cholangitis
- AIDS cholangiopathy
- Choledocholithiasis



Pancreas

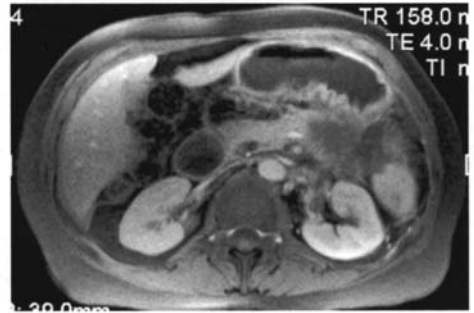
MASS

NEOPLASM

Gland

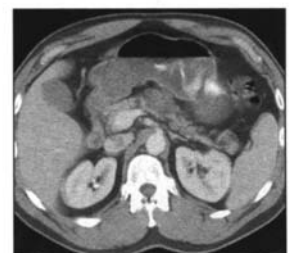
AISLE

- Adenocarcinoma
- Islet
- Solid and papillary epithelial neoplasm
- Lymphoma
- MEts

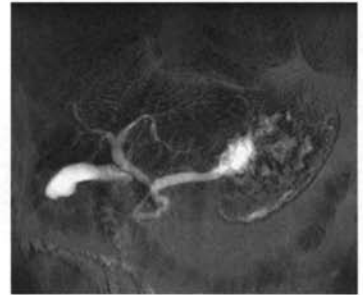
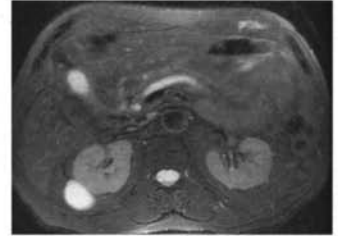
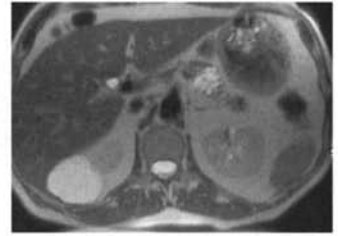


Duct

- Macrocytic
- Microcytic
- IPMT (intraductal papillary mucinous tumor of the pancreas)



Duct (continued)



INFLAMMATORY

PANCREATITIS

Focal



OTHER

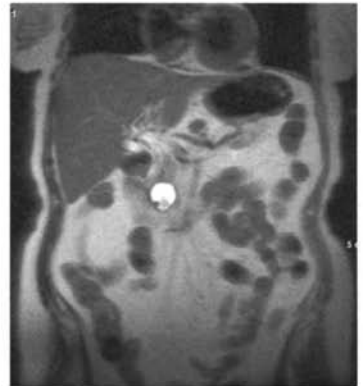
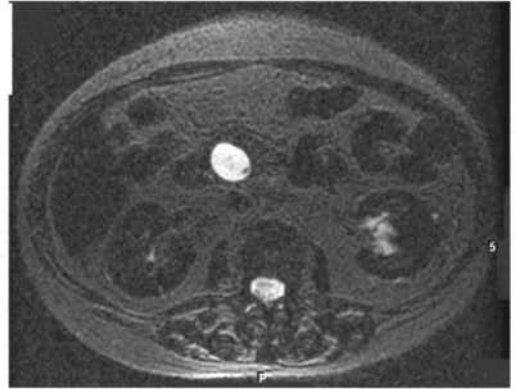
Abscess
Pseudocyst



Real Cyst-VHL, PCKD



Choledochal cyst
Spleen



CYSTIC LESION

MATE

Metastasis
Abscess
Traumatic Cyst/Congenital Cyst
Echinococcal



SOLID LESION

Granulomatous disease
Metastasis: melanoma

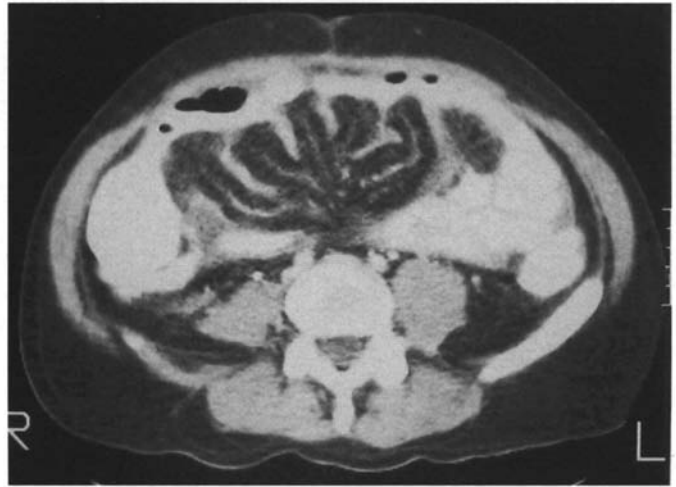
Hemangioma/sarcoma
Infarct



Peritoneal Masses

PEPPERCORN MELT

Peritoneal Carcinomatosis
Mesothelioma
Lymphoma
TB



4

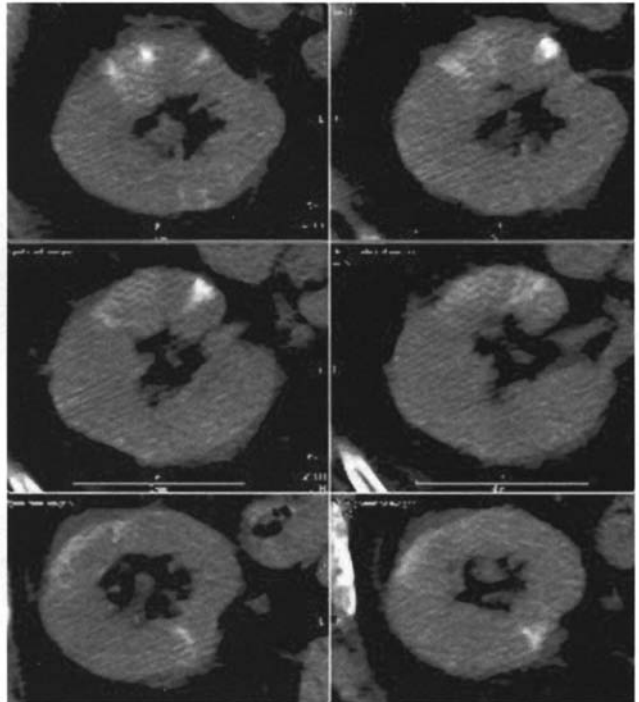
Genitourinary Radiology

NEPHROCALCINOSIS

Cortical

COAGS

- Cortical necrosis
- Oxalosis
- Alports
- Glomerulonephritis
- Sickle cell disease



From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

Medullary**MARCH**

Medullary Sponge Kidney

Alkali

RTA

Cushing's syndrome

HPTH



PAPILLARY NECROSIS

NSAID

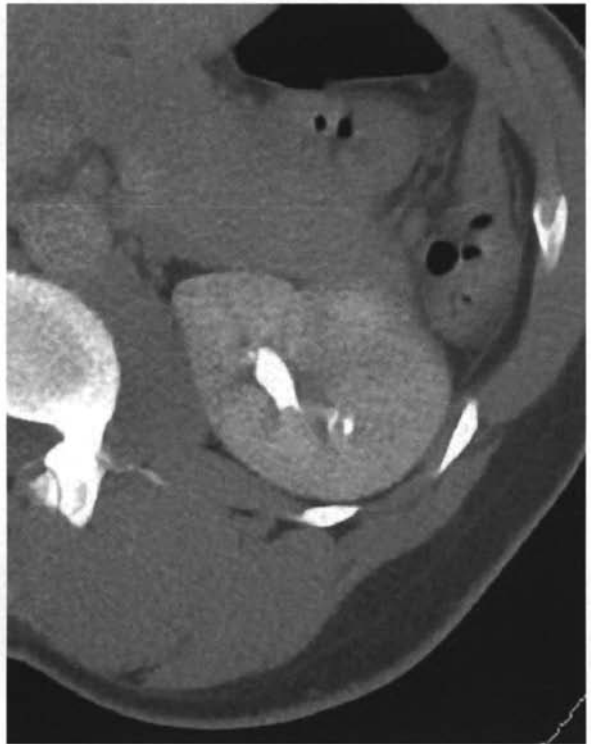
NSAID

Sickle cell

Analgesic

Infection TB/Pyelo

Diabetes



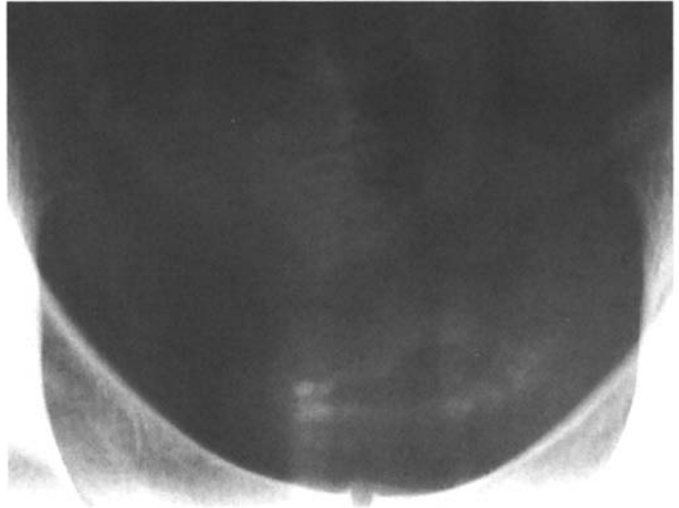
NSAID (continued)



BLADDER WALL CALCIFICATION

STIR

Schisto
Tb/TCC
Interstitial
or eosinophilic cystitis
Radiation



URETERAL STRICTURE

MISTER

Mets
Inflammation (stone)
Schisto
Tb/TCC/Trauma
Endometriosis
Radiation



URETERAL DEVIATION

TAP YOUR FRIEND ON THE SHOULDER

Lateral

TAP

- Tumor (retroperitoneal)
- Aneurysm/adenopathy
- Peritonealization of ureters/post op

Medial

FRIEND

- Fibroid
- RPF
- Idiopathic
- Enlarged prostate
- Node dissection
- Diverticulum



RENAL MASS (CATEGORIZE BY ENTITY OR SHAPE)

BY ENTITY

Tumor

CYSTIC

Cystic RCC

MLCN

Mets

SOLID

Parenchymal—RCC

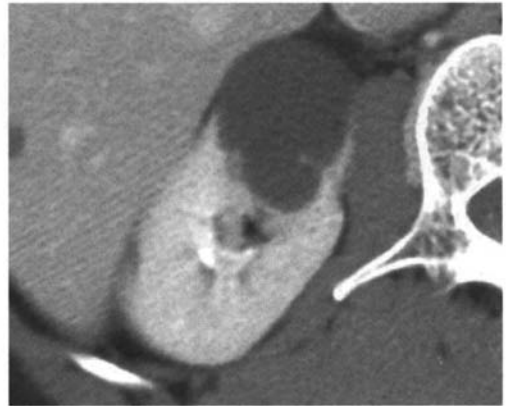
Mesenchymal—AML

Collecting System—TCC

OTHER

Mets

Lymphoma

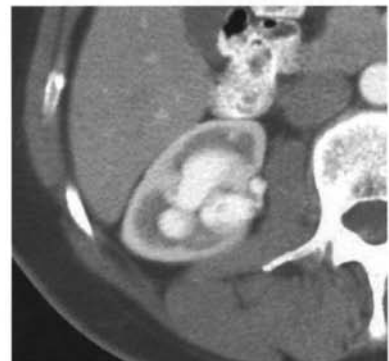
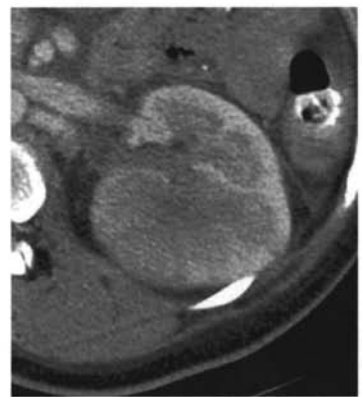
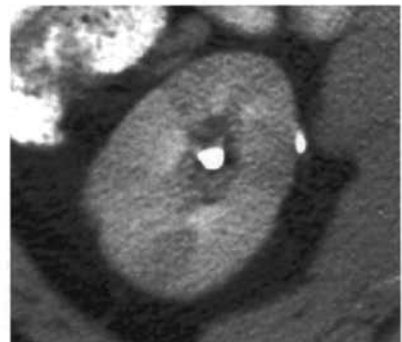
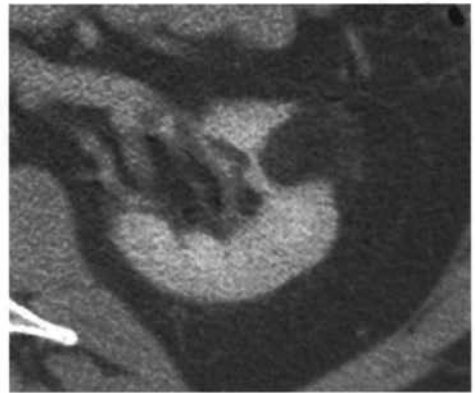


Infection

- Abscess
- Pyelonephritis
- XGP focal or diffuse

Vascular

- AVM
- Hematoma



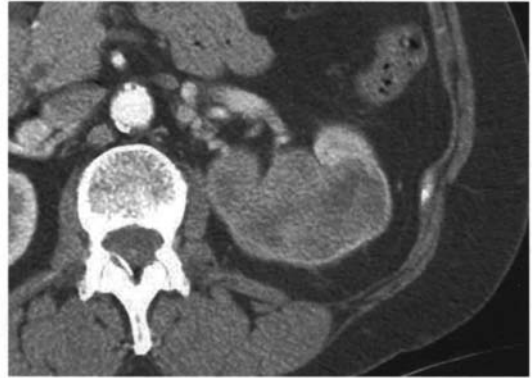
BY SHAPE

Bean-shaped (entire kidney)

- Metastasis
- Diffuse RCC or TCC
- Lymphoma
- Infarction

Ball-shaped (single mass)

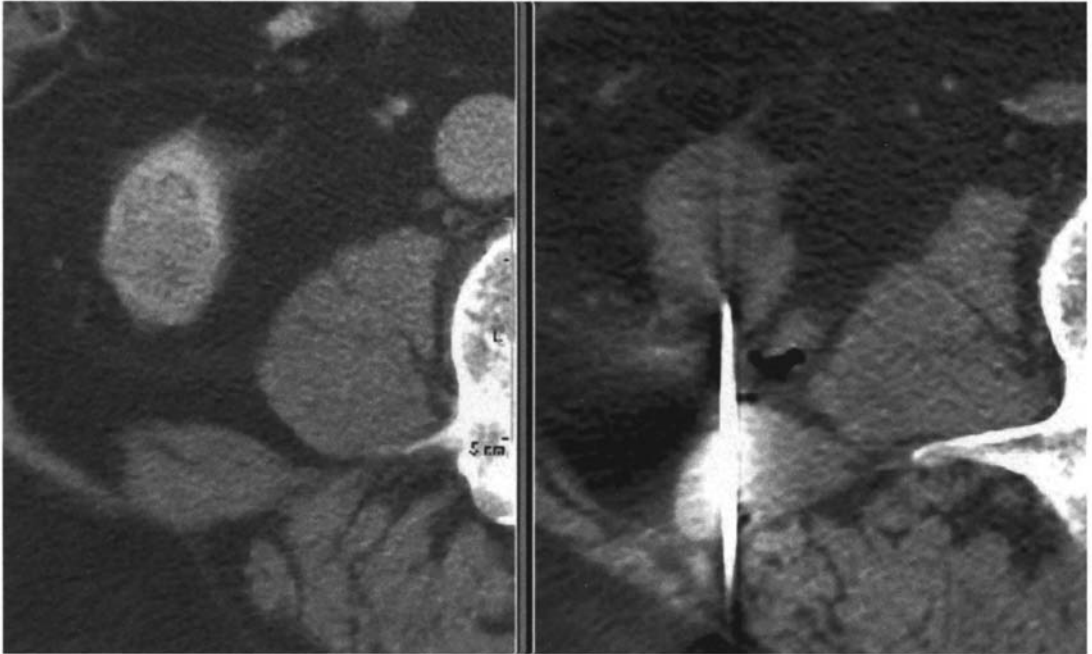
- RCC
- TCC
- Metastasis
- Infection



WHEN DO YOU BIOPSY?

When it changes management

- ? Metastatic disease
- ? Lymphoma (medical vs sx treatment)
Single kidney
- ? Abscess



INFUNDIBULAR NARROWING

- Inflammatory — Stone
- Infection — TB—“Phantom calyx”
- Instrumentation — Trauma
- TCC — “Oncocalyx”



URETERAL DILATATION

PRESSURE OVERLOAD

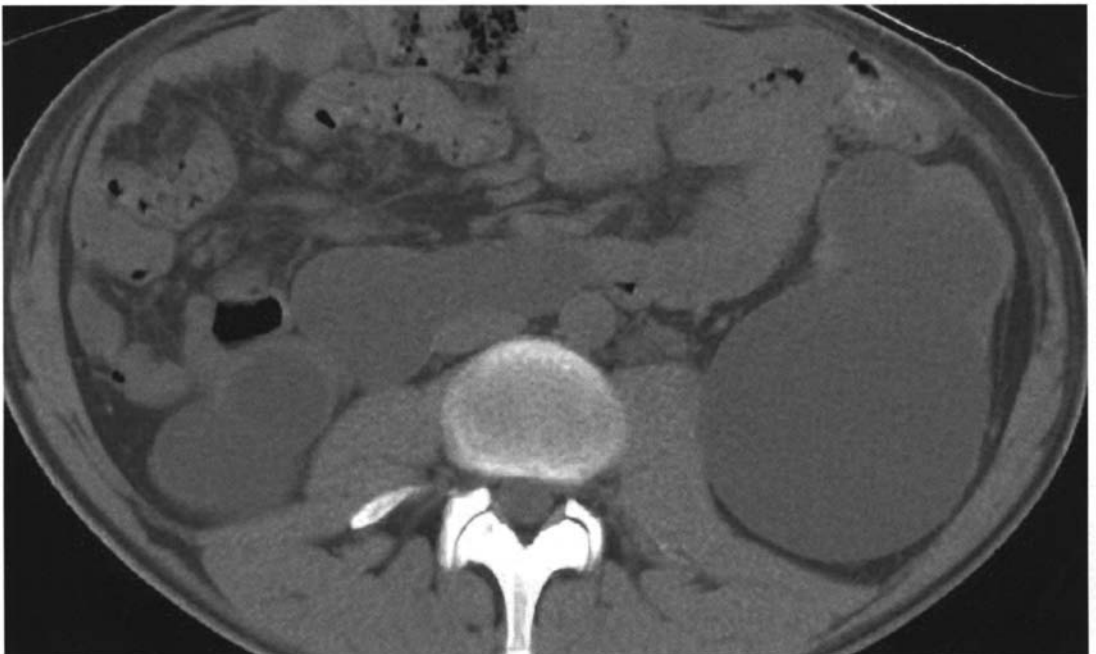
Obstruction

VOLUME OVERLOAD

Reflux
Diuresis

INTRINSIC ABNORMALITY

Eagle Barrett
1° Megaureter



DELAYED NEPHROGRAM

PRERENAL

Hypotension
RAS

RENAL

Glomerulonephritis
ATN
Papillary necrosis

POSTRENAL

Crystals/proteins
Obstruction—ureteral or venous



STRIATED NEPHROGRAM

MOP

Medullary sponge
Obstruction—vascular or ureteral
(stone)
Pyelonephritis

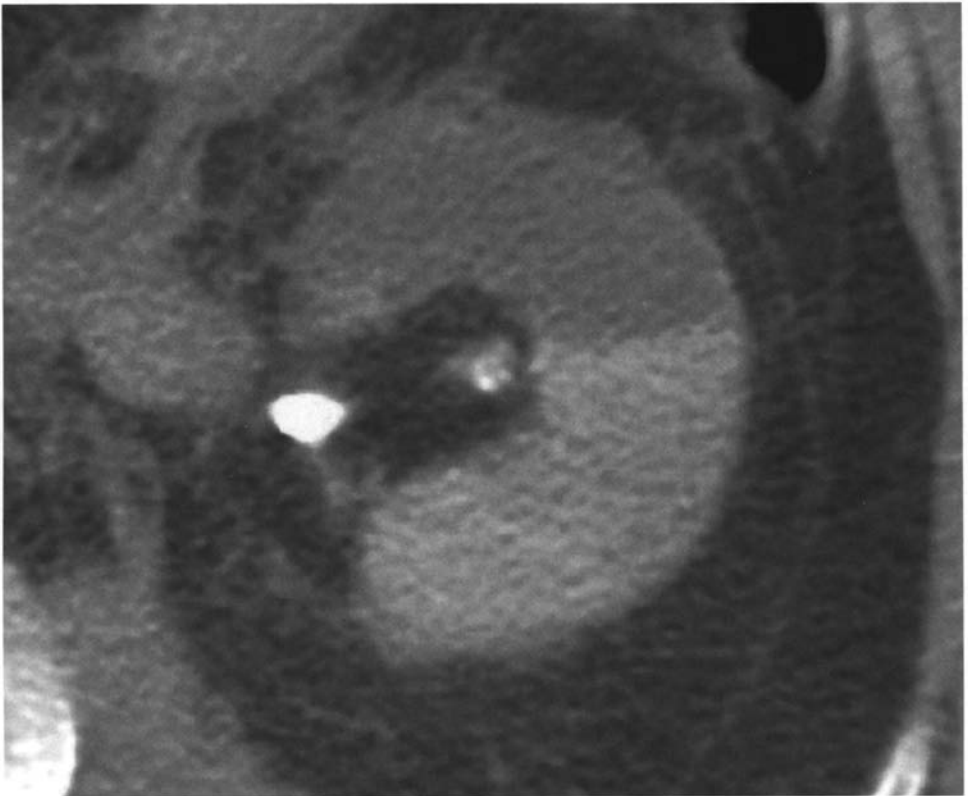


RIM SIGN**RAM**

Renal vein thrombosis

ATN

Main renal artery thrombus/avulsion



UNILATERAL SMALL KIDNEY

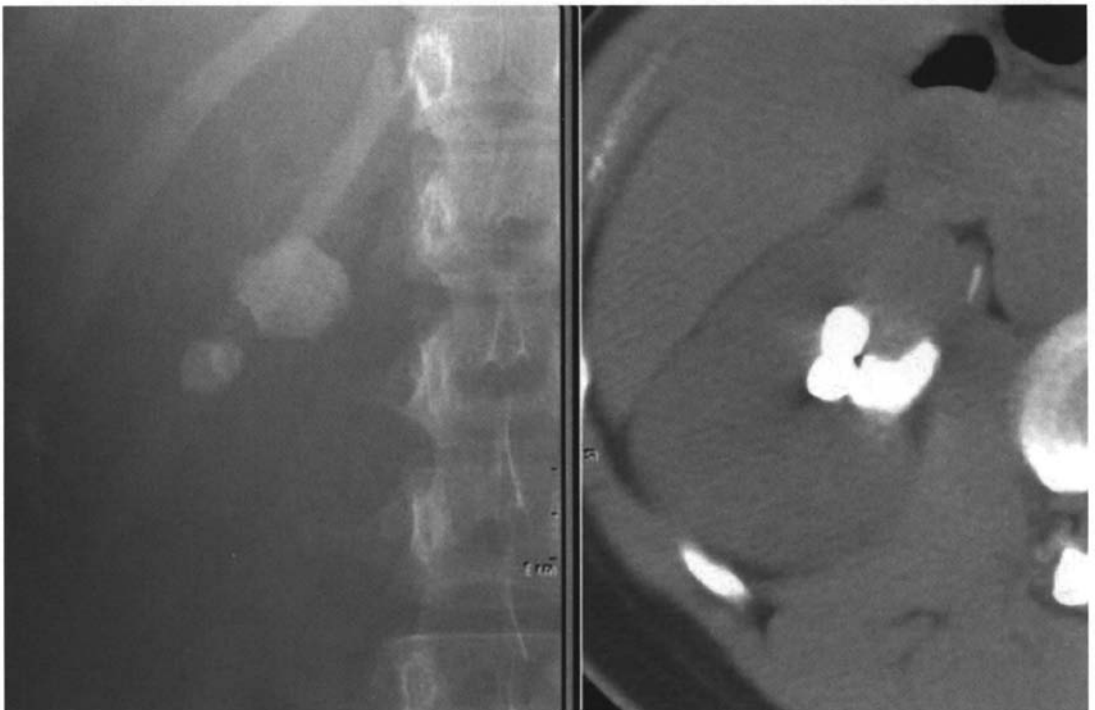
- Renal artery stenosis
- Reflux nephropathy
- Nephritis (chronic)
- Congenital

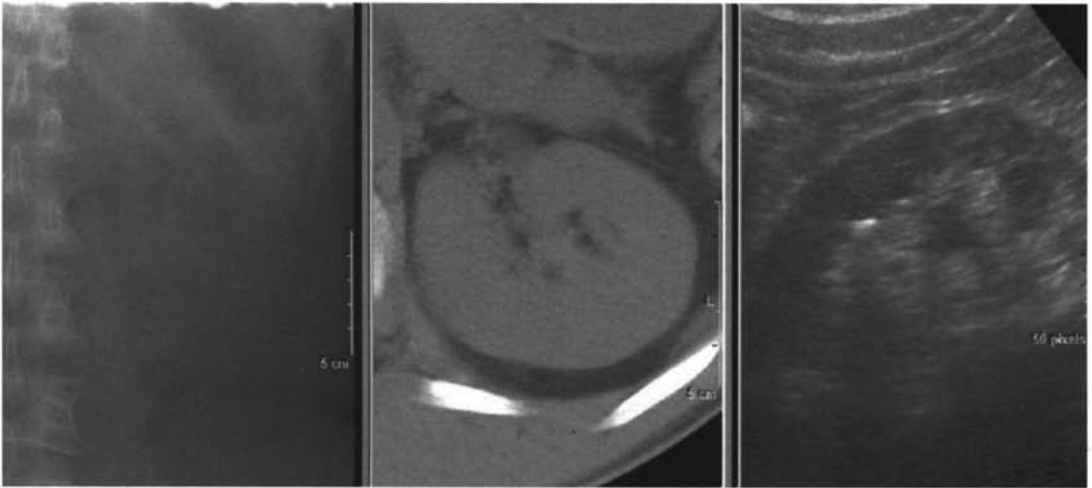
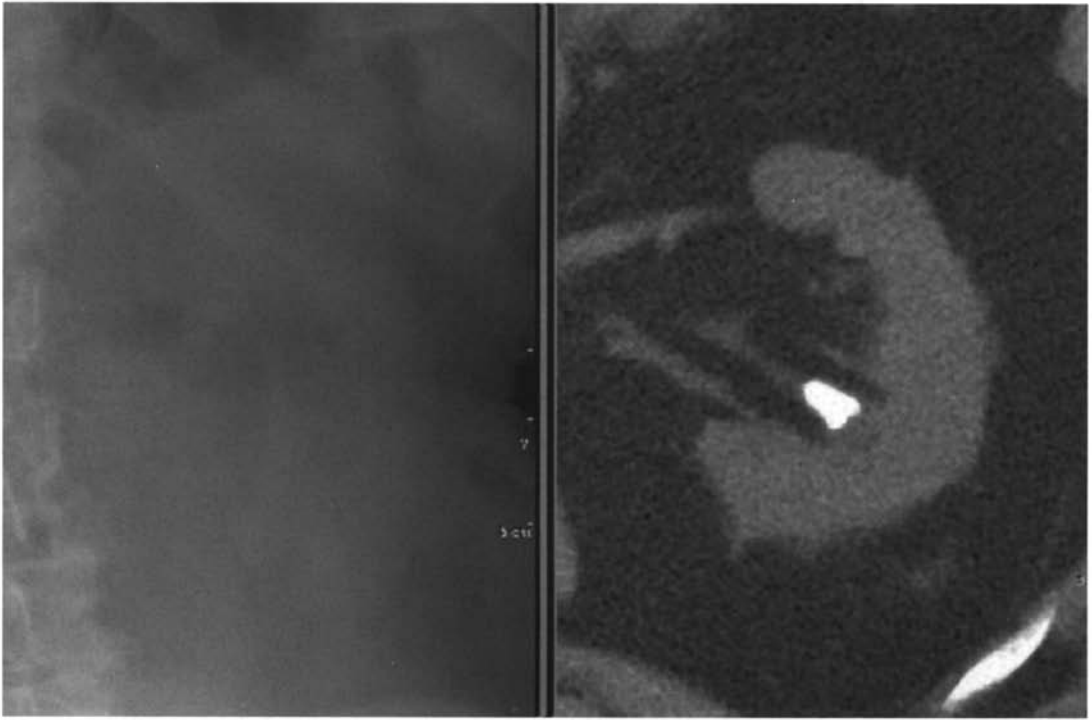


RENAL AND URETERAL STONES

(Radio-opaque + / Radiolucent -)

	<i>Plain film</i>	<i>CT</i>
Calcium oxalate	+	+
SMUX		
Struvite		
Matrix	-	+
Uric acid		
Xanthine		
Indinavir	-	-





RENAL TRANSPLANT

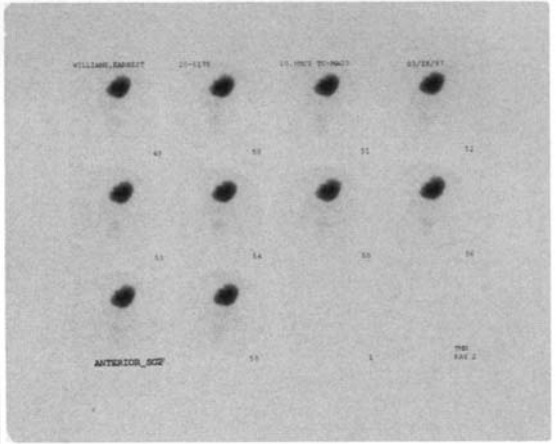
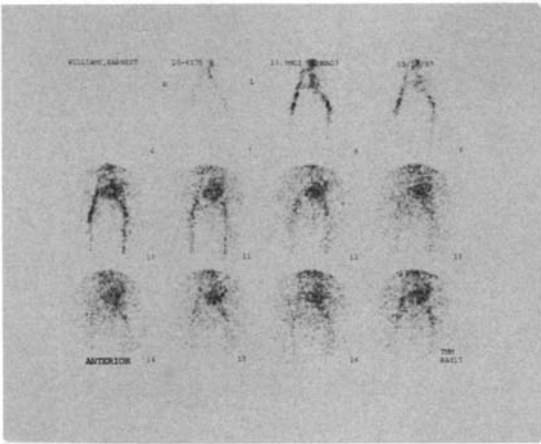
Flow

FCN

ATN

Normal

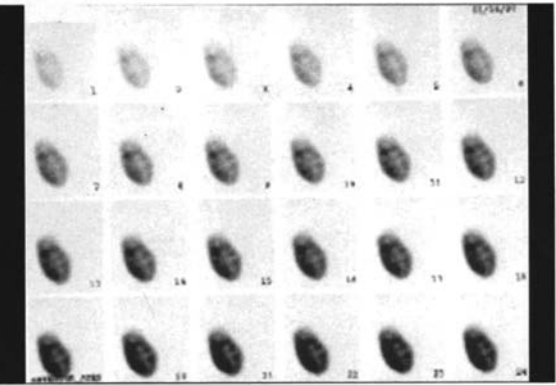
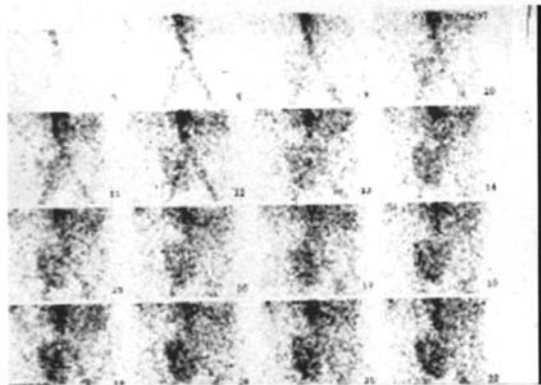
Decreased <24 h



Rejection

Decreased

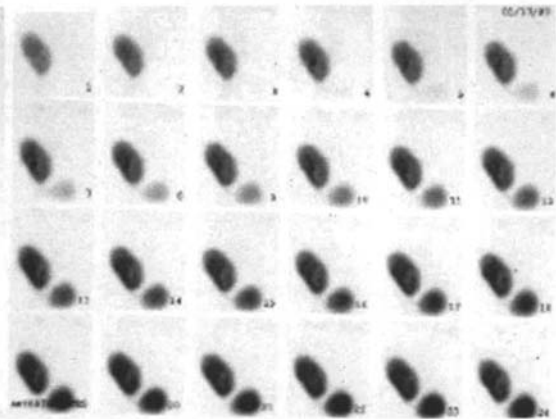
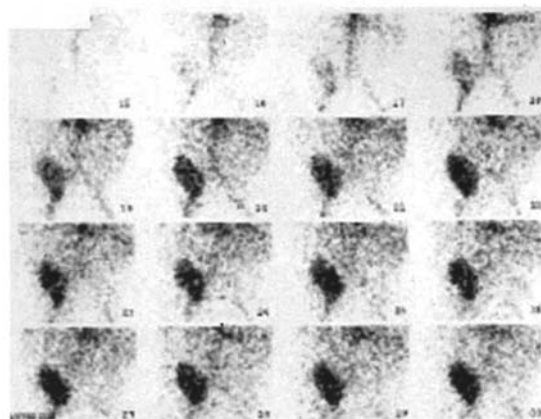
Decreased



Cyclosporine

Normal

Decreased >24 h



URETERAL FILLING DEFECTS

Single

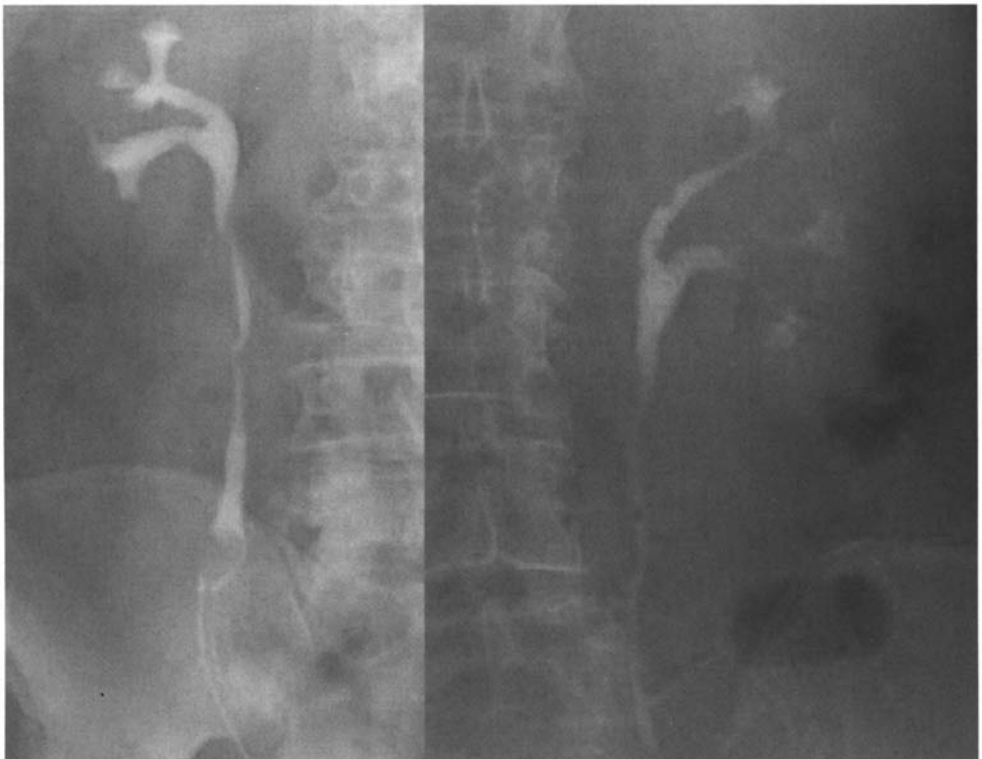
5CS

- Calcium (stones)
- Cancer (TCC)
- Clots (blood)
- Candida (fungus ball)
- Crazy papilla (papillary necrosis)

Multiple

SLUMM

- Stones
- Leukoplakia
- Ureteritis cystica
- Malakoplakia
- Metastasis — Melanoma



PEAR-SHAPED BLADDER

LAUNCH

- Lipomatosis
- Adenopathy/lymphoma
- Urinoma
- Neurofibromatosis
- Caval obstruction (collaterals)
- Hematoma (trauma)



Adrenal

MASS

CORTICAL

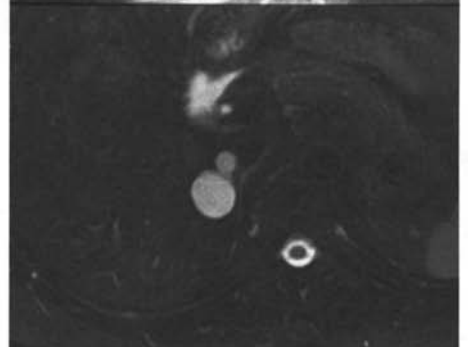
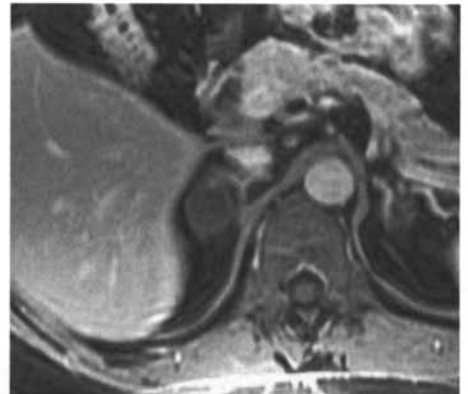
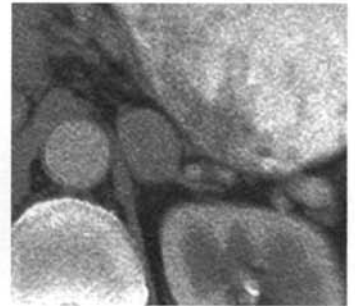
- Adenoma
- Carcinoma
- Metastasis

MEDULLARY

- Pheochromocytoma (5 Ps)
 - pain
 - pallor
 - palpitations
 - perspiration
 - panic

CYSTS

- True—congenital
- Pseudo—posthemorrhagic
- Infectious—echinococcal



Retroperitoneum

NORMAL TO HEMORRHAGE

- Neural (schwanomma, NF)
- Ormond's disease (idiopathic RPF)
- RPFibrosis (secondary — drug/tumor)
- Metastasis from genital system
- Adenopathy — infectious
- Lymphoma
- Hemorrhage**



URETHRAL STRICTURE

I³

Infection

Gonorrhea

TB

Schistosomiasis

Iatrogenic

Injury—posttraumatic



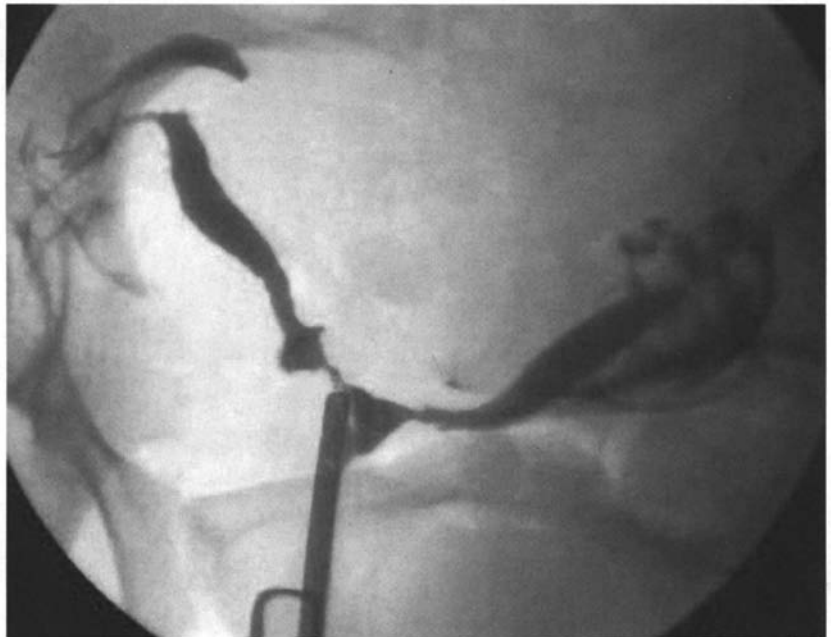
Uterus

HSG

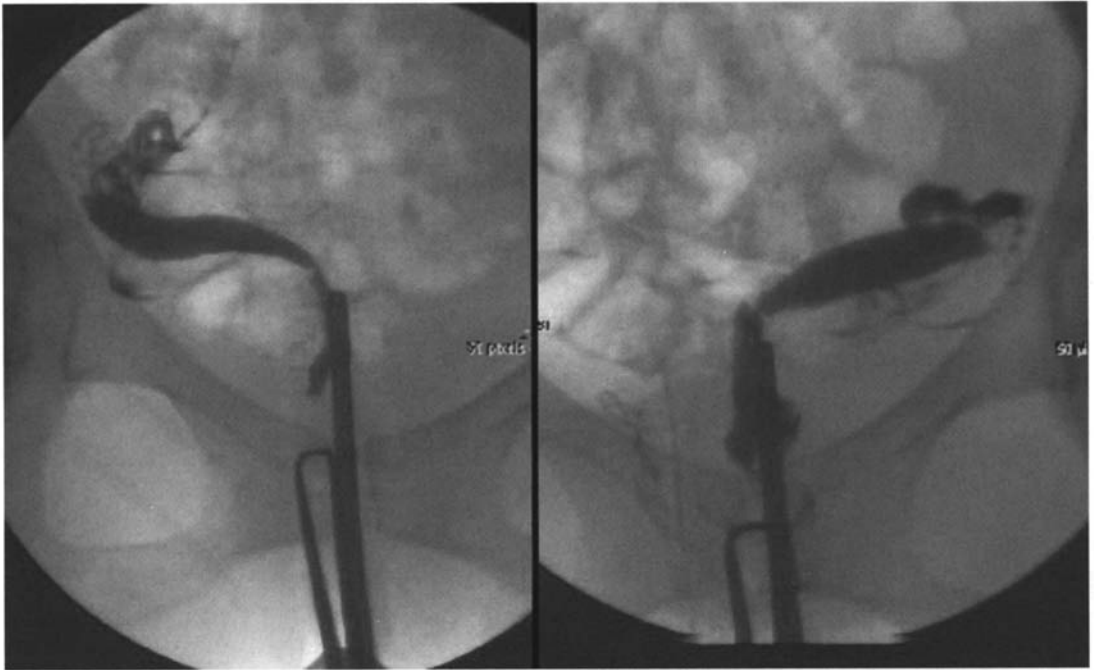
Can be shown essentially two types of cases with abnormalities:
Uterus or Fallopian tube

Uterine Cavity

Bicornuate vs Septate



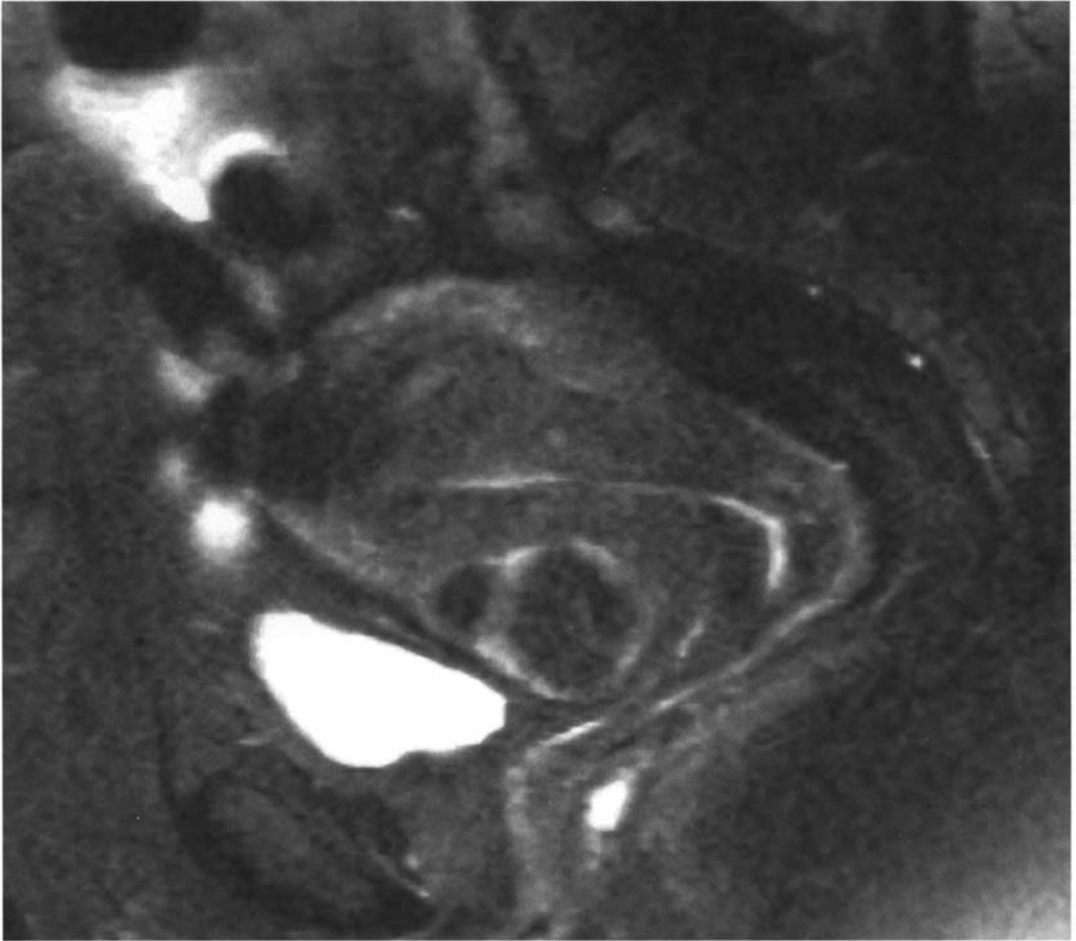
Didelphys



DES

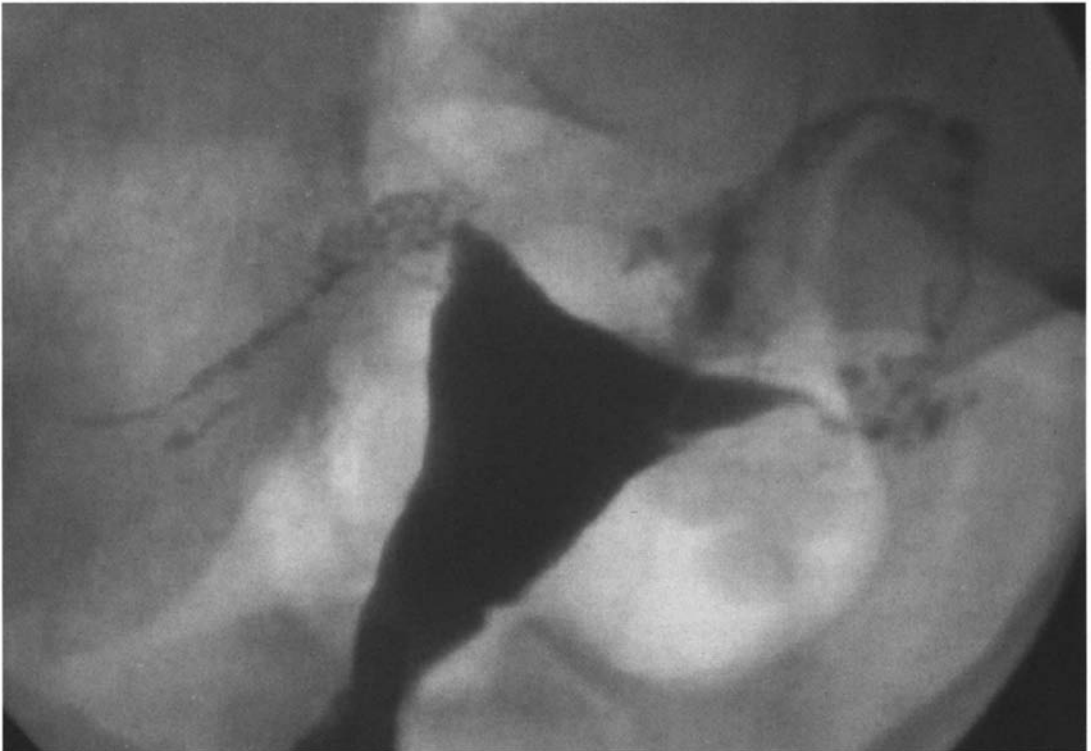


Asherman's Syndrome
Adenomyosis



Fallopian Tube

Salpingitis Isthmica Nodosa
TB
Obstruction



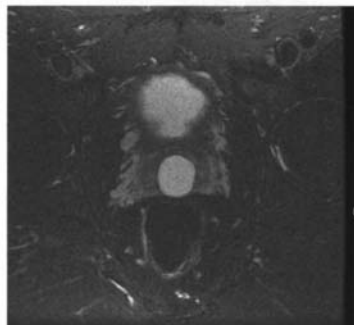
Prostate

CYSTS

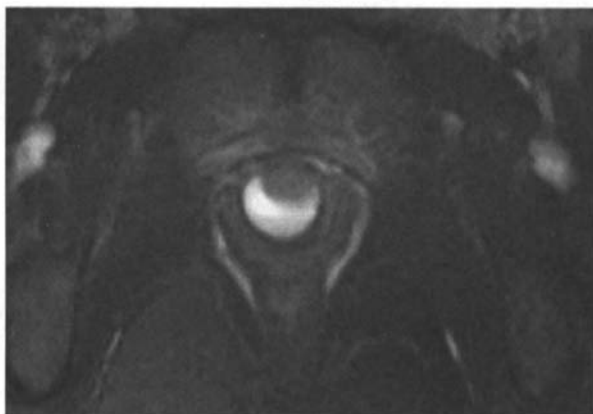
Midline

"U" CYST

Utricle



Urethra (connected)



Urethral polyp association

Undescended testicle association

"S" CYST

Mullerian

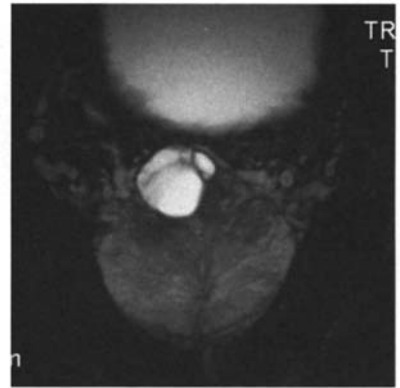
Sperm containing

Stone forming

Superior extending (above prostate)

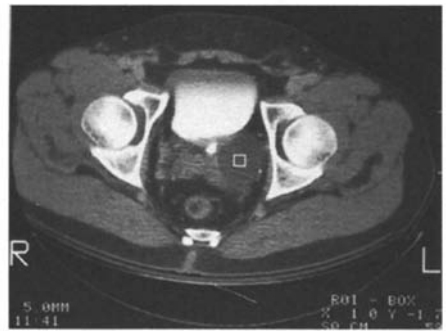
Paramedian

- BPH
- Ejaculatory duct cyst



Lateral

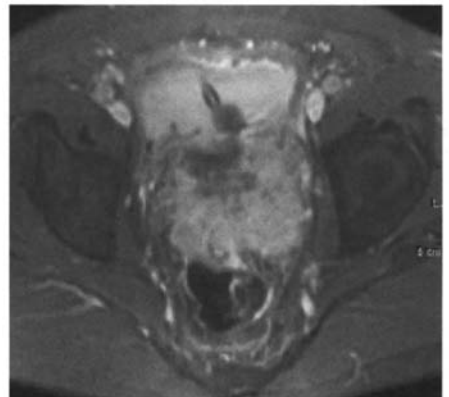
- Seminal vesicle cyst (renal agenesis association)



Infection

Neoplasm

- Peripheral zone (prostate carcinoma)



5

Head and Neck Radiology

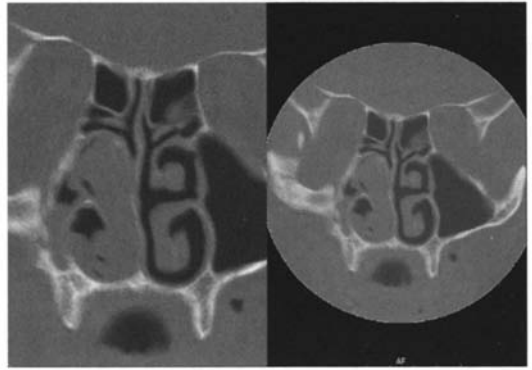
Includes plain film diagnosis of the skull, sinuses, mastoids, spine & head & neck structures and all other imaging and special procedures related to the central nervous system head & neck. This includes angiography, myelography, interventional techniques, CT, and MRI.

Sinuses

NASOPHARYNGEAL MASS

AISLE

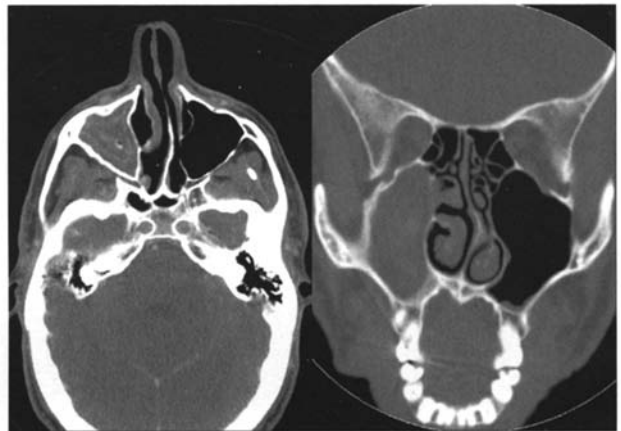
- Antrochoanal polyp
- Inverted papilloma (destroys bone)
- Lethal midline granuloma
- Squamous cell carcinoma (destroys bone)
- Esthesioneuroblastoma (destroys bone)



SINUS MASS

AFIP

- Antrochoanal polyp
- Atelectatic sinus
- Fungal sinusitis
- Inverted papilloma
- Polyposis



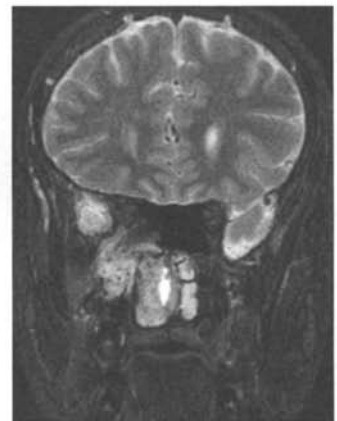
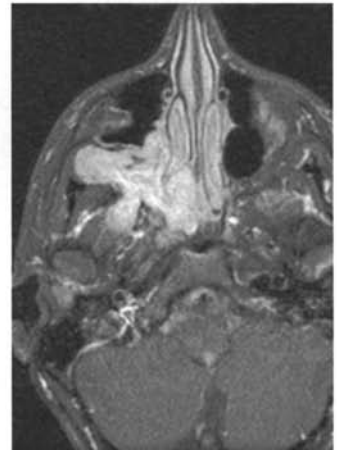
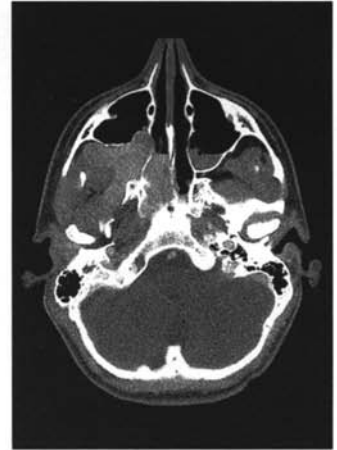
Head & Neck Spaces

PTERYOPALATINE FOSSA

Juvenile angiofibroma

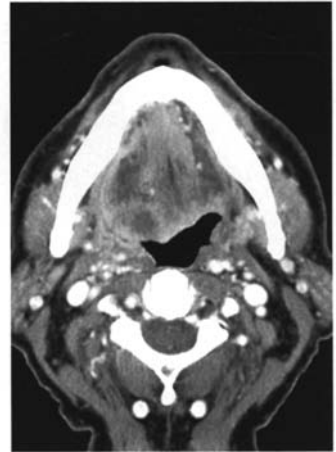
Schwannoma

Perineural spread from V2 (palate—mouth)—adenoid-cystic, melanoma, lymphoma



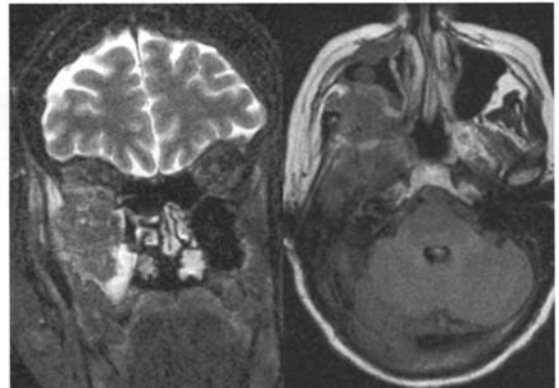
ORAL CAVITY/OROPHARYNX

Dermoid
 Ranula
 Hemangioma
 SCC
 Minor salivary



MASTICATOR SPACE

Bone—Odontogenic abscess
LN—Lymphoma
Muscle—Sarcoma
Nerve— V3 Schwann/NF
Mucosa— SCC



PAROTID SPACE/PRE STYLOID PARAPHARYNGEAL SPACE

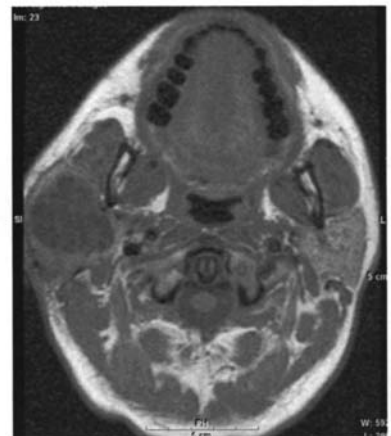
PLEASE WATCH OUT for HEMANGIOMAS

Benign:

Pleomorphic adenoma
 Warthins
 Oncocytoma
 Hemangioma

Malignant:

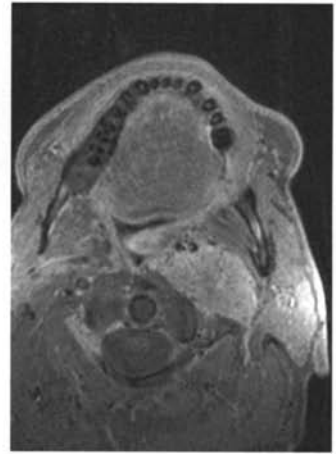
Minor salivary gland tumors



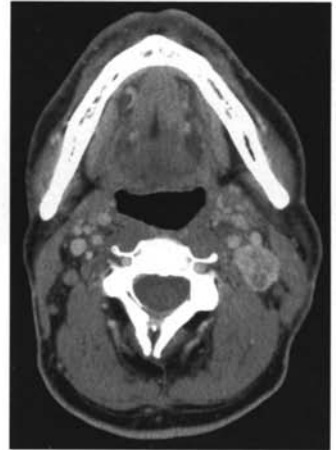
CAROTID SPACE

V—Carotid body tumor

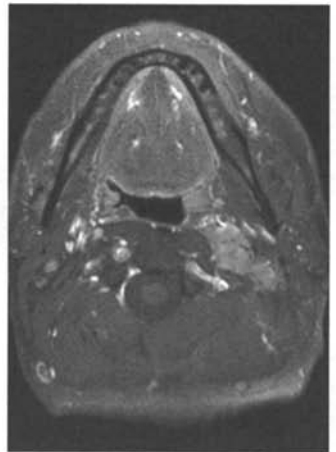
N—Schwannoma/NF



LN—Mets

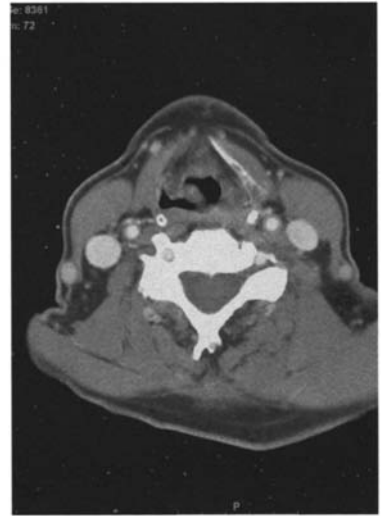


M—SCC



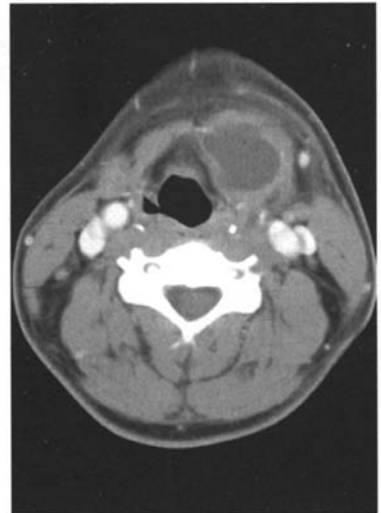
PHARYNX

Laryngocele



CYSTIC NECK MASS

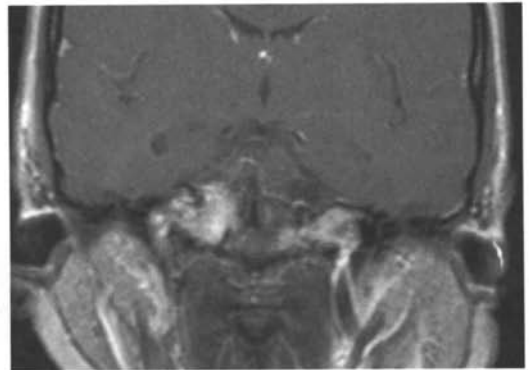
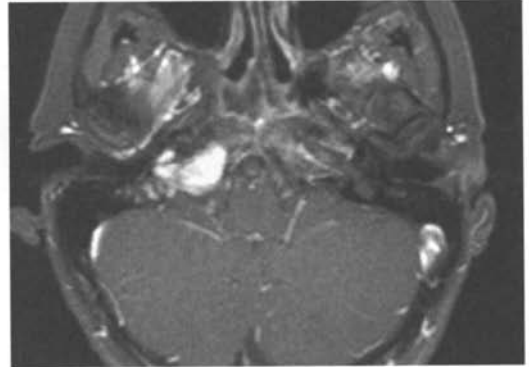
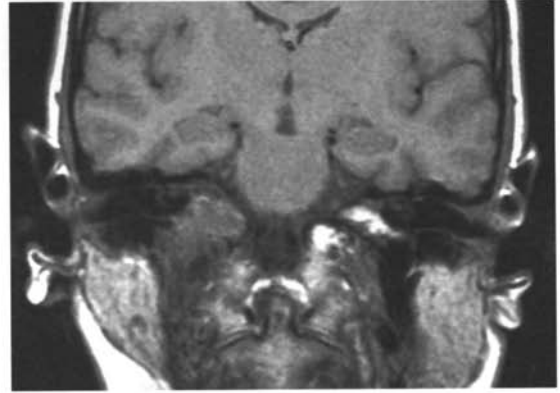
- Second brachial cleft (fat)
- Thyroglossal duct (medial)
- Cystic hygroma (everywhere)
- Laryngocele (pharynx)
- Abscess (retropharyngeal space)
- Necrotic nodes



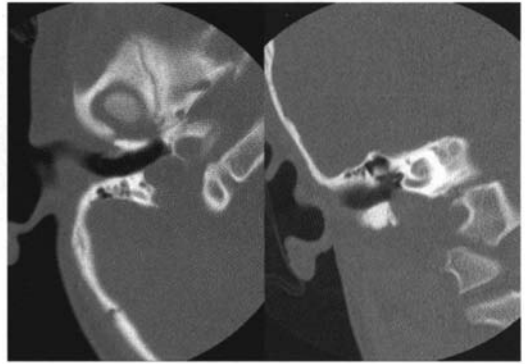
Other

PULSATILE TINNITUS

Glomus tumor



Dehiscent jugular vein (bulb)



Aberrant carotid
AVM

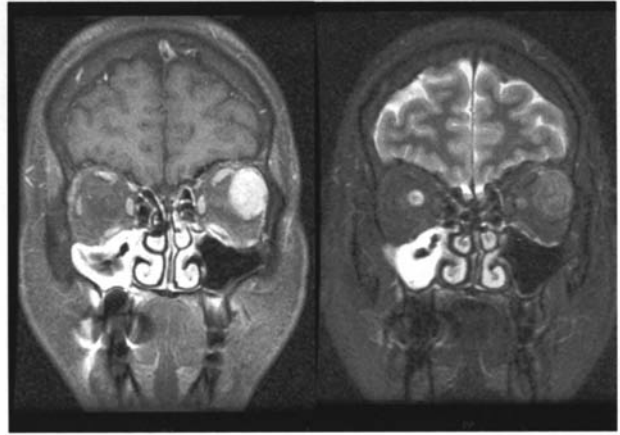


Orbit

LACRIMAL GLAND

MELDS

- Metastasis
- Epithelial tumor—pleomorphic adenoma/carcinoma
- Lymphoma
- Dermoid
- Sjogrens/Sarcoid



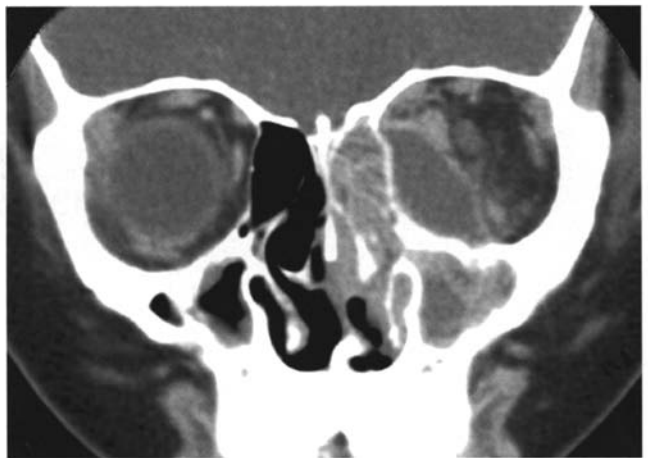
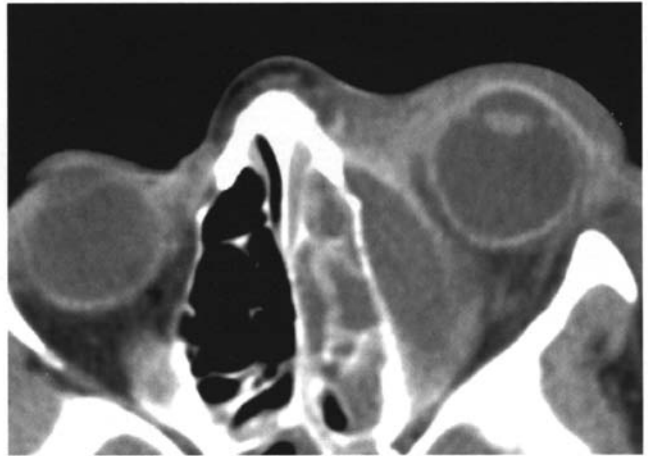
EXTRACONAL**LIMP + RHABDO**

Lymphoma

Infection

Mets

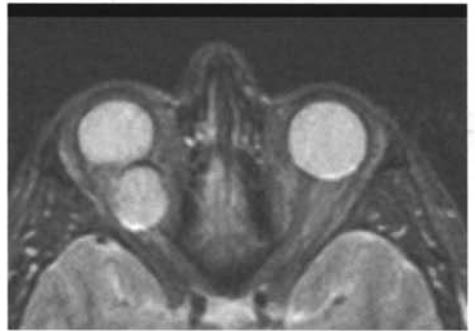
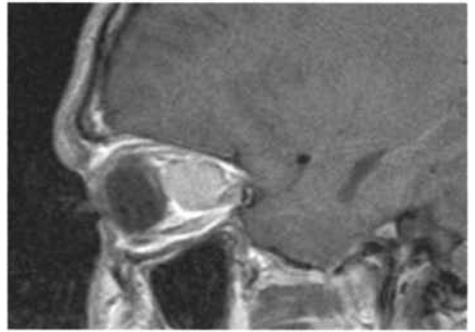
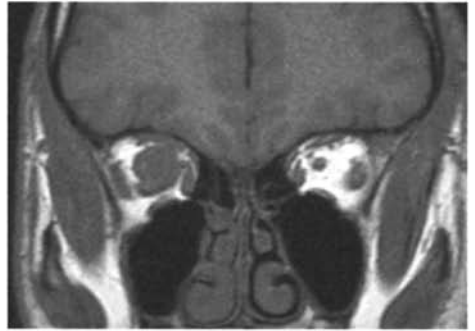
Pseudotumor

Rhabdomyosarcoma

INTRACONAL

LIMP + HEMANGIOMA

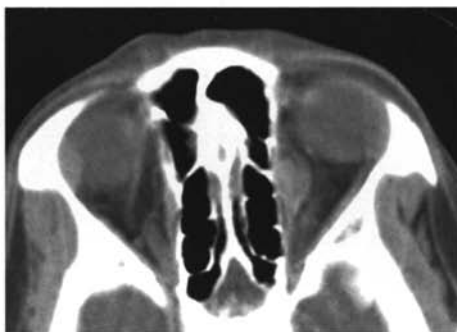
- Lymphoma
- Infection
- Mets
- Pseudotumor
- Hemangioma**



EXTRAOCULAR MUSCLES

LIMP + GRAVES

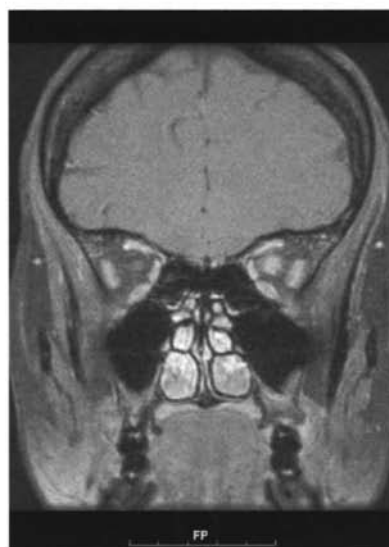
- Lymphoma
- Infection
- Metastasis
- Pseudotumor
- Graves**



OPTIC NERVE

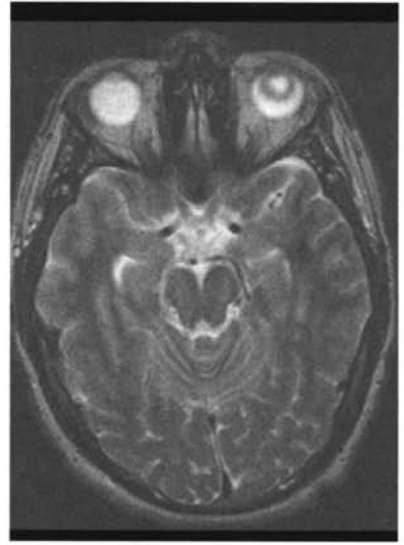
LIMP + GMN

- Lymphoma
- Infection
- Metastasis
- Pseudotumor
- Glioma**
- Meningioma**
- Neuritis



GLOBE

- Mets
- Melanoma
- Drusen



LEUKOCORIA

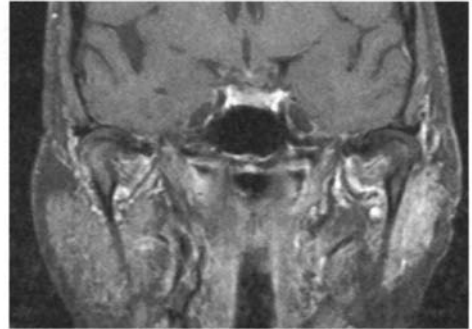
- Retinoblastoma
- PHPV
- Coats
- RLF (retrolental fibroplasia)
- Phthisis bulbi



Angle of Mandible

ANTERIOR MASS

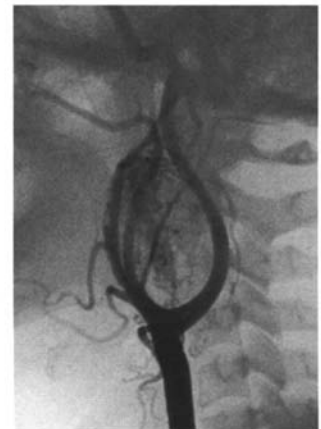
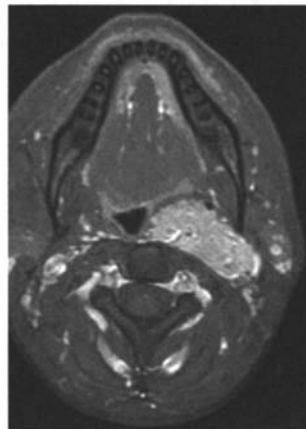
Submandibular gland mass
Sublingual gland mass
Larynx
Parotid



POSTERIOR MASS (LOOK AT CAROTID)

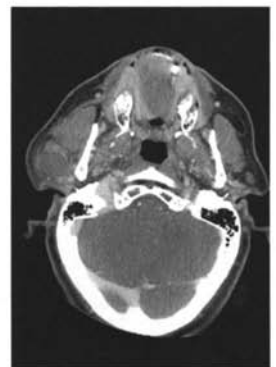
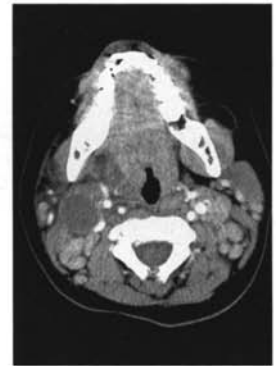
Splayed

Carotid body tumor



Lateral

- Brachial cleft cyst
- Papillary thyroid CA
- Cystic schwannoma
- Cystic hygroma
- Lymphoma/Node



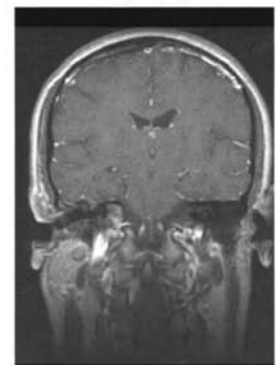
Posterior

- Node or Nerve



Medial

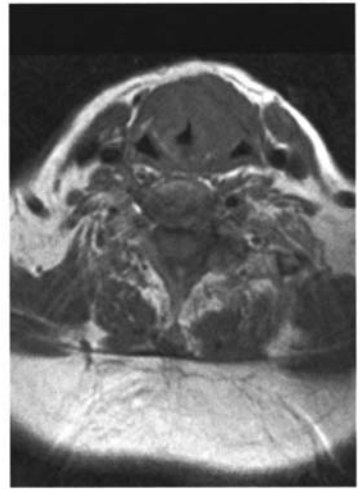
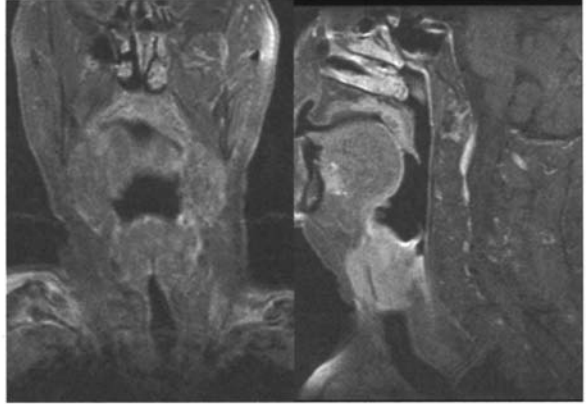
- Nerve only



Neck

TUMOR

- Glottic
- Supraglottic (FAT)
- Subglottic



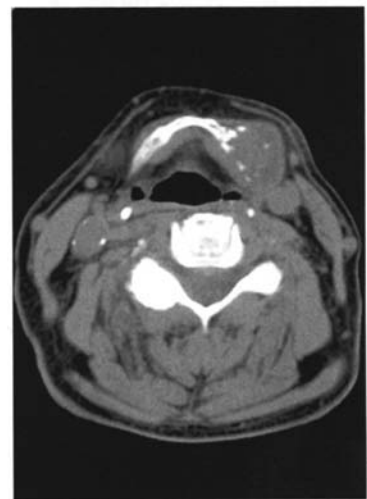
MIDLINE OR SOMEWHAT OFF MIDLINE

Cyst

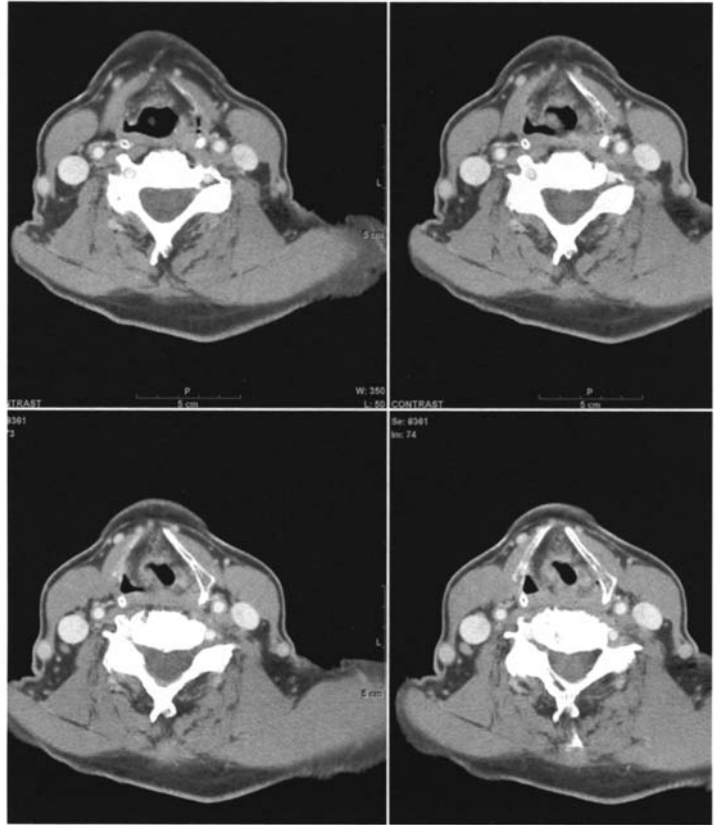
Thyroglossal duct cyst

Bone

Chondrosarcoma



Submucosal
Laryngocele



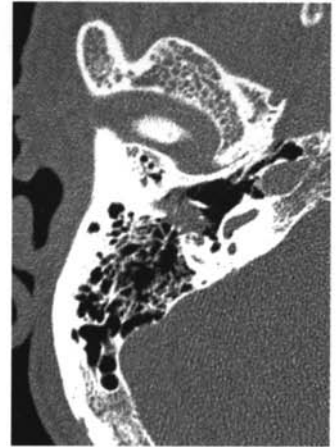
Temporal Bone

WHITE MASS

Cholesteatoma

- a. Tegmen tympani ? intact
- b. Lat wall semicircular canal ? intact
- c. Facial nerve—
Location? Bone? Relationships?

Cholesterol Granuloma



RED MASS

Glomus Jugulare

- Erodes pars vascularis
- do angio to determine vs hemangioma

Glomus Tympanicum

- Jugular bulb ok
- no angio

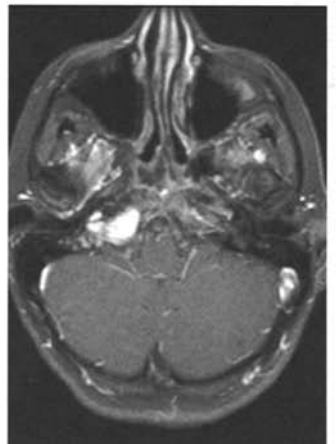
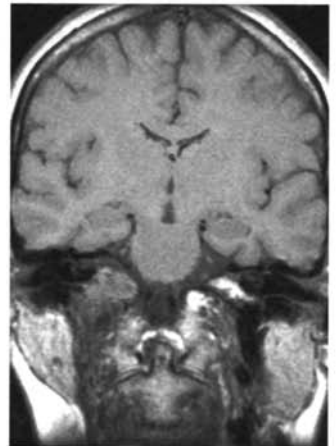
Aberrant Carotid

- Peristant stapedial artery

Jugular Bulb Anomalies

WORKUP

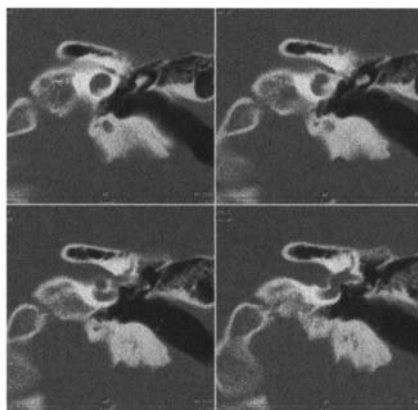
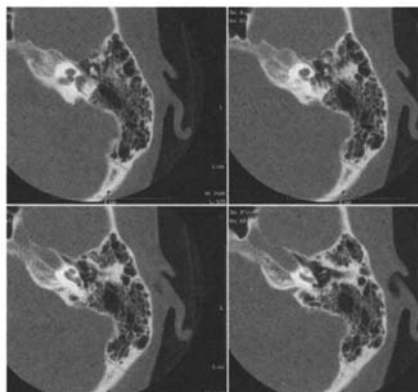
- CT separates aberrant carotid/GJ/GT
- MR for flow void assessment and extent



OTHER

MONDINI

- Inner ear
- Segmentation cochlear problem
- Interscalar septum
- Lateral semicircular canal (central post absent)
- Vestibular aqueduct—bigger than posterior semicircular canal

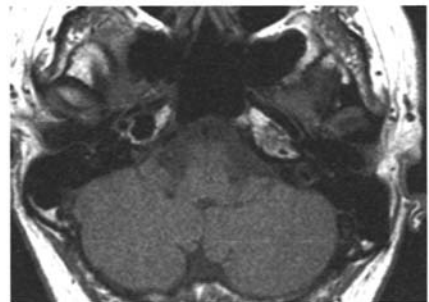
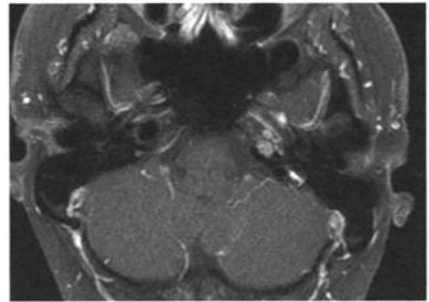
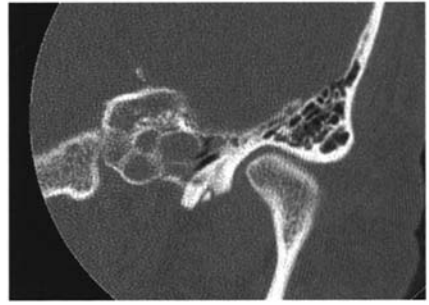


PETROUS EXPANSION

Cholesterol cyst/granuloma T1 BRIGHT

Epidermoid/cholesteatoma T1 DARK

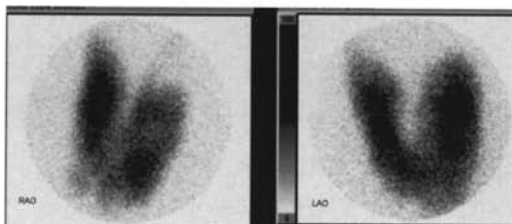
Mucocele



Thyroid

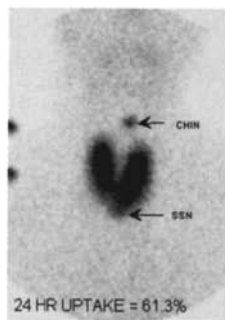
SUBACUTE

Post-viral
Hypothyroid
Fever, chills, pain

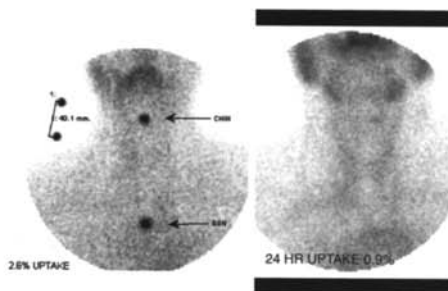


HASHIMOTO'S

Early — Hyperthyroid



Late — Hypothyroid



GRAVES

Goiter
Thyrotoxicosis
Increased uptake — gland hot

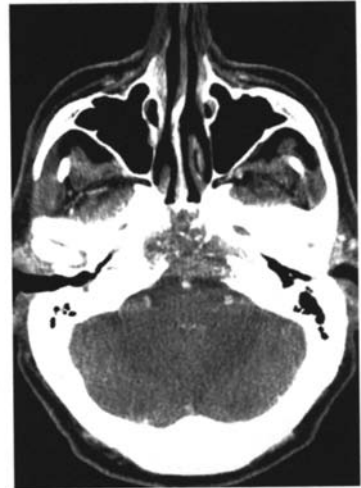
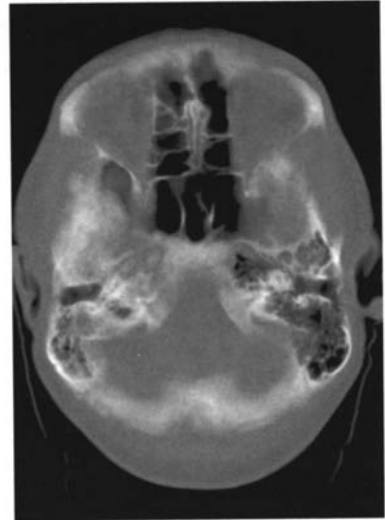


Skull Base

BY LOCATION

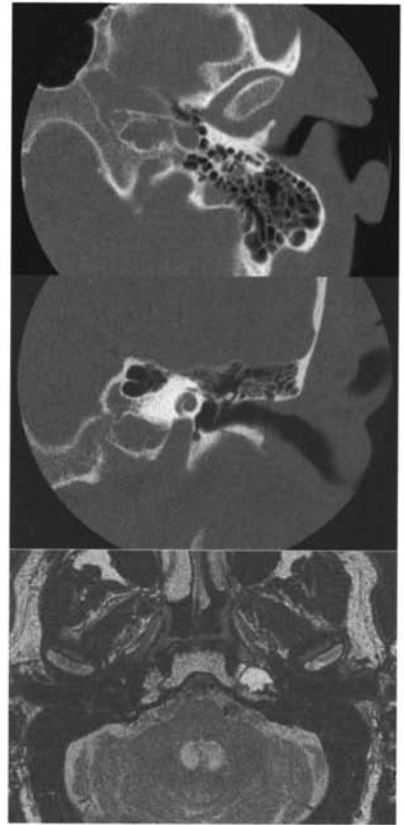
Midline

- Craniopharyngioma
- Chordoma



Paramedian

Carotid aneurysm
Chondrosarcoma

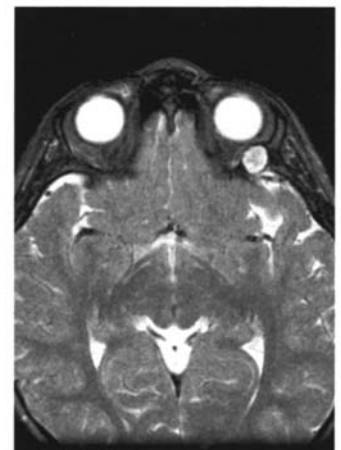
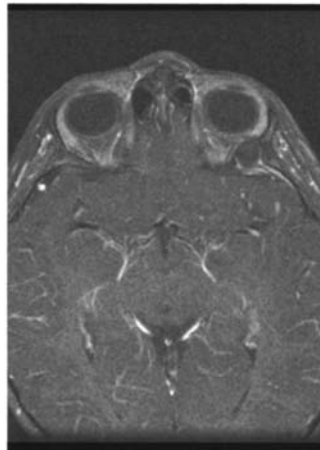
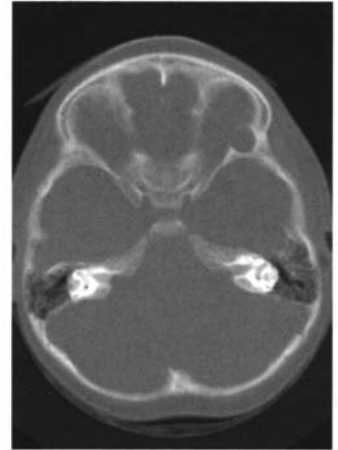
***Lateral (GW of sphenoid)***

Meningioma
Metastasis
Dermoid
Glomus
Epidermoid
Cholesterol cyst



Always Include

- Mets
- Myeloma
- Lymphoma



LACRIMAL

- Epithelial**—Pleomorphic adenoma, Adenoid cystic, Mucoepidermoid
- Lymphoid**—Lymphoma, Sjogren, Benign lymphoid hyperplasia



6

Vascular and Interventional

Includes the diagnosis of all abnormalities and anomalies of the arteries, veins, and lymphatics. It includes all vascular and nonvascular imaging-directed interventional procedures. All modalities and techniques used in diagnostic and interventional procedures are also included.

GENERAL APPROACHES

1. Technique

- a. Which vessel injected
- b. Phase of injection
 - i. Arterial—early/mid/late
 - ii. Venous—early/mid/late

2. Anatomy

- a. Which vessels are opacified?
- b. Are the expected vessels based on the injection filled?
- c. Are any vessels missing?
- d. Are there vessels that should not be filling?
- e. Anatomy—too small/too large/filling defects/cutoff
- f. Are there vessels that are filling early?

TECHNIQUE SPECIFICS

VASCULAR

Injection and Filming Rates

Pulmonary artery	20 cc/s	for	40 cc	at	8 f/s
Thoracic aorta	25 cc/s	for	50 cc	at	8 f/s
Abdominal aorta	20 cc/s	for	40 cc	at	6 f/s
Pelvic aorta/bifurcation	10 cc/s	for	20 cc	at	2 f/s
Iliac artery	5 cc/s	for	10 cc	at	2 f/s
Celiac artery/SMA	5 cc/s	for	50 cc	at	2 f/s
Inferior mesenteric artery	3 cc/s	for	30 cc	at	2 f/s
Renal artery	4 cc/s	for	8 cc	at	4 f/s
Carotid artery	6 cc /s	for	10 cc	at	4 f/s
Subclavian artery	5 cc /s	for	10 cc	at	3 f/s
IVC	20 cc/s	for	30 cc	at	4 f/s

ANGIOPLASTY

CHOOSE

1. Diameter (usually 10% larger than the vessel)

- a. Aorta 20 mm
- b. Common iliac 8 mm
- c. External iliac 7 mm
- d. SFA 6 mm
- e. Popliteal 5 mm
- f. Tibial 3 mm
- g. Dorsalis pedis 2 mm
- h. Renal/cealic/SMA 6 mm

2. Length

a. Most successful for **SHORT, CONCENTRIC, NON-CALCIFIED**

3. French size (for pressure measurement, sheath should be 2 FR >catheter)

4. Shaft length of balloon

5. Burst pressure of balloon

6. Gradients

a. Significant = >10 mmHg at rest, >20 mmHg after challenge
or >10% of systolic BP

EMBOLIZATION

EMBOLIC AGENTS

Liquid

- ETOH
- Glue

Particulate

- Gelfoam slurry
- Ivalon/PVA
- Clot
- Embolization spheres

Devices

- Coils
- Balloons

THROMBOLYSIS

AGENTS

tPA (Alteplase) (arterial):	Infuse at 0.5–1 mg/h. Typically place 10 mg of tPA in 1000 cc of NS and infuse at 50 cc/h (0.5 mg/h). The mean time to lysis is about 20 h. The average total dose is 10–20 mg. The total dose to the patient should not exceed 40 mg.
tPA (venous):	Same infusion rate as arterial.
tPA (Alteplase) (line lysis):	Place 2 mg of tPA in 2 cc of NS and dwell in the lumen for 2 h then aspirate.
RPA (Retaplast):	Same as Alteplase but much more published experience with Alteplase.
Streptokinase:	Do not use due to anaphylactic reaction possibility.
Urokinase:	100,000 U/h divided between infusion catheters.
This agent, however, is	no longer being manufactured.
Heparin:	1000 U/h for target PTT for 60–80 s

Contraindications

ABSOLUTE

Active internal bleeding
Irreversible limb ischemia
Recent stroke
Brain tumor
Left heart thrombus

RELATIVE

History of GI bleeding
Major surgery within 10 d
Diabetic hemorrhagic retinopathy
Coagulopathy
Embolus of cardiac source

UTILIZED MEDICATIONS

VASODILATORS

Nitroglycerin—100 µg doses
Priscoline—25 mg doses
Papaverine—25 mg doses

VASOCONSTRICTORS

Vasopressin—0.1–0.4 µg

ANALGESICS/AMNESICS

Morphine—1 mg bolus, 1 mg maintenance
Versed (midazolam)—1 mg bolus, 1 mg maintenance
Fentanyl 50 µg bolus, 50 µg maintenance

ANTAGONISTS

Naloxone (opioid antagonist) 1 mg IV
Flumazenil (benzodiazepene antagonist) 0.2 mg IV

COMMONLY TESTED PROCEDURES

Vascular Intervention

VENA CAVA FILTER

1. Access femoral vein
2. Place pigtail catheter at iliac confluence and perform IVC gram to determine size of IVC and renal vein location
3. Exchange for wire and IVC filter sheath
4. Deploy filter
5. Re-perform IVC gram

TIPS

1. Right internal jugular vein approach with US guidance
2. Place small catheter into hepatic veins and perform venogram after obtaining wedge pressures
3. Using direct puncture, create a connection between the right hepatic vein and right portal vein and place a wire into the portal system
4. Dilate the tract with balloon angioplasty and deploy metallic stent
5. Determine post-procedure gradients and consider coiling varices

Nonvascular Intervention**BILIARY DRAINAGE**

1. Antibiotics
2. Right lateral midaxillary approach (RIGHT SYSTEM) or subxyphoid approach (LEFT SYSTEM)
3. Chiba needle or one stick system with slow injection and retraction of needle under fluoroscopy. Repeat until bile ducts visualized
4. Exchange for guidewire and plastic catheter with passage into duodenum
5. Dilate skin and place drain
6. Confirm position by fluoroscopy

CHOLECYSTOSTOMY

1. US guidance to determine pathway that is transhepatic to minimize bile leak
2. Use small spinal needle to access GB and in tandem insert 8 FR catheter
3. Aspirate for bile for culture and sensitivity
4. Left in until surgery or at least 3 wk to form tract

PERCUATENOUS GASTROSTOMY

1. If ascites: Do paracentesis first
2. Indication dictates type of tube: feeding—GJ tube, drainage—G tube
3. Using US guidance, determine left edge of liver and spleen
4. Cup of barium from night before to outline colon through NG tube
5. Insufflate stomach
6. Gastropexy with T-tacks and retract the stomach to the abdominal wall in the high gastric body
7. Place needle between the 4 T-tacks with placement of a stiff wire into the stomach
8. Dilate skin and place peel-away sheath.
9. Place tube
10. T-tacks removed in 3–6 wk.

ABSCCESS DRAINAGE

1. Two methods: TROCAR vs SELDINGER
2. Localize abscess under CT or US guidance.
3. TROCAR:
 - a. Access abscess with small spinal needle and aspirate pus for microbiology
 - b. Adjacent to spinal needle, in tandem, place catheter

4. SELDINGER:
 - a. Use one stick needle and place into abscess
 - b. Place wire through sheath
 - c. Dilate tract
 - d. Place drainage catheter
 - e. Aspirate abscess for microbiology

PERCUTANEOUS NEPHROSTOMY

1. In the prone position, locate the kidney under US guidance.
2. Place a small spinal or equivalent needle in the upper pole calyx
3. Infuse a small amount of dilute contrast
4. Using a second one stick system, access the middle pole calyx under fluoroscopic guidance
5. Place wire into collecting system
6. Dilate skin
7. Place PCN tube

GENERAL VASCULAR DIFFERENTIAL DIAGNOSIS

AV TIMER

Atherosclerosis

Vasculitis

- a. Large vessel: GIANT/TAKAYASU
- b. Medium vessel: BERGER/BEHCET
- c. Small vessel: CTD-SCLERODERMA LUPUS

Trauma (Dissection)

Infection

Metabolic (Diabetes) or Meds (Ergots)

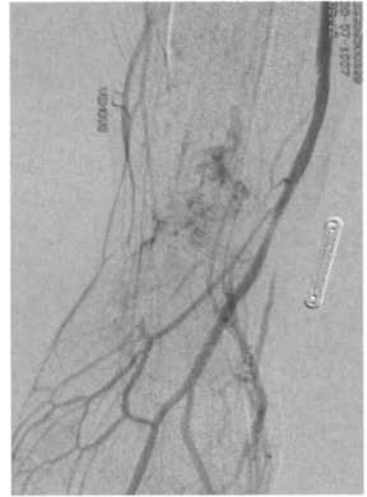
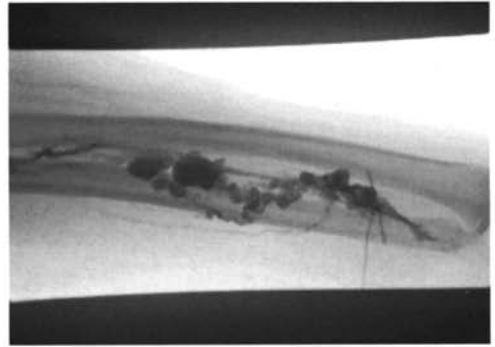
External (Tumor)

Radiation

TUMOR DESCRIPTORS

NAP IN BED

- Neovascularity
- AV shunting
- Puddling
- Blush
- Encasement
- Displacement of normal vessels



SMALL AORTA

- Williams Syndrome
- Takayasu (<40), giant cell arteritis (>40)
- Small aorta syndrome (female) (smoker)
- Dissection
- Neurofibromatosis



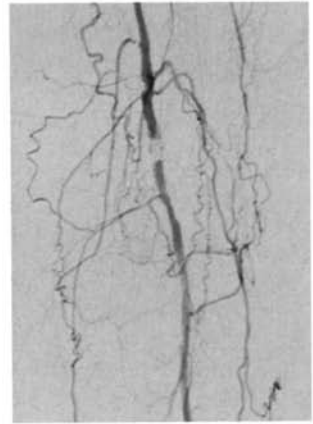
POPLITEAL ENTITIES

Intrinsic

Thrombus (popliteal aneurysm)

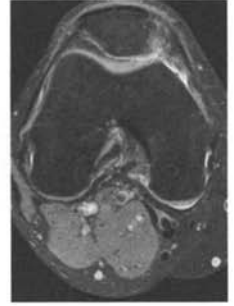
Embolus

Trauma

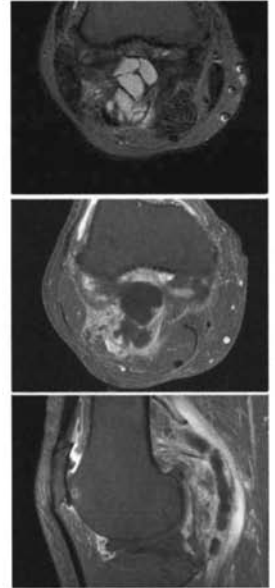


Extrinsic

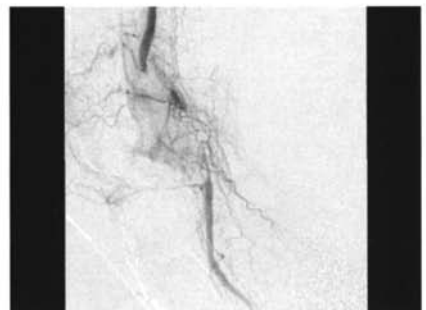
Popliteal entrapment syndrome



Cystic adventitial disease (MRI Dx)



External tumor



RENAL

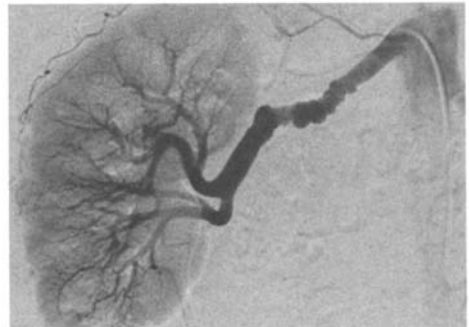
Aneurysms

- Polyarteritis nodosa
- Lupus
- Scleroderma
- Wegeners
- HIV
- Drug-induced



Artery

- Atherosclerosis
- FMD (renal, ICA, illiac, viscerals)
- NF
- Arteritis
- Radiation
- Dissection



AORTIC ROOT

Aneurysm

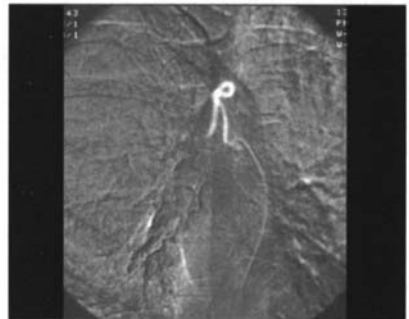
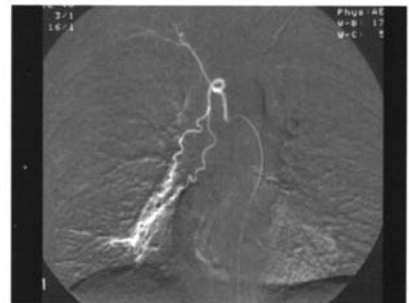
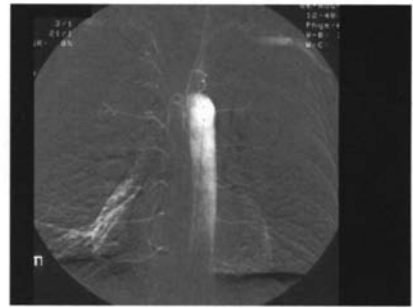
- Connective tissue disease (involves the root)
- Atherosclerosis (look at the rest of the aorta)
- Trauma
- Vasculitis
- Mycotic
- Syphilis (Luetic)



HEMOPTYSIS

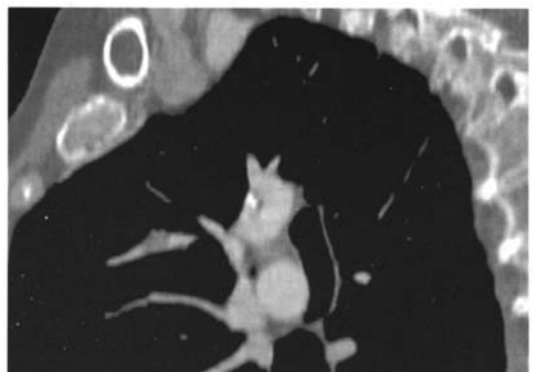
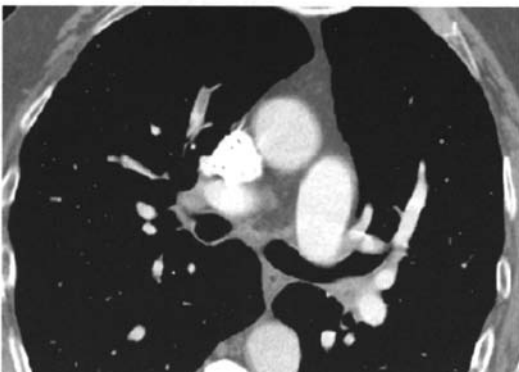
Bronchial

- Check spinal artery in field
- Cystic fibrosis
- Bronchiectasis
- TB
- Aspergillus

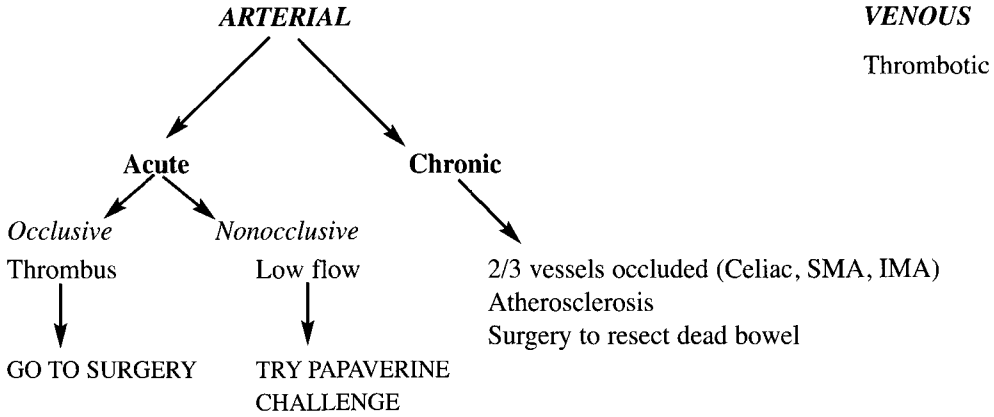


Pulmonary Artery

- Pulmonary embolus
- Infarction

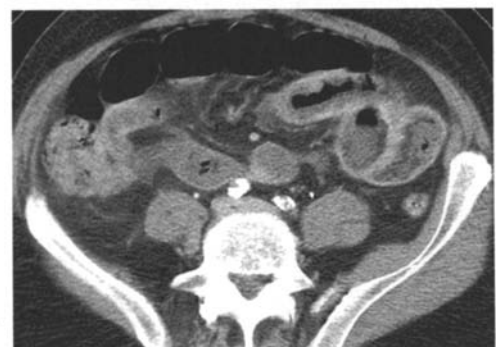
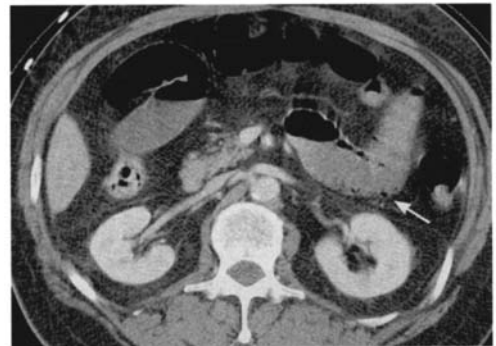
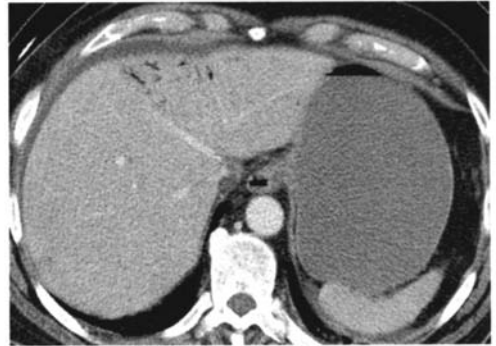


MESENTERIC ISCHEMIA



ENDPOINTS

- Ischemia to bleeding
- Decompensates — peritoneal signs
- Improve and wean
- Heparin drip with thrombolysis

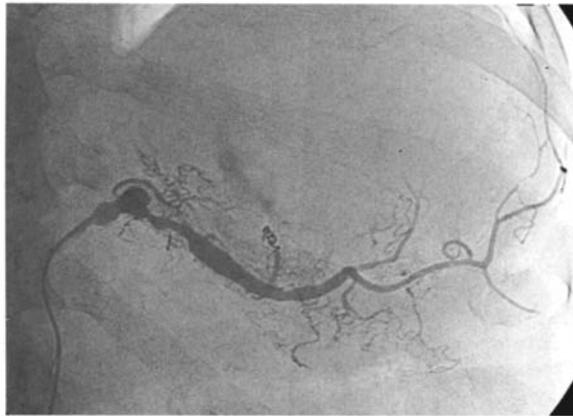


GI BLEEDING

UGI (Proximal To Ligament of Treitz)

LGI

<i>UGI (Proximal To Ligament of Treitz)</i>		<i>LGI</i>	
ARTERIAL	VENOUS	SB	LB
Gastritis Peptic Ulcer Pseudoaneurysm	Varices Mallory Tear	Leiomyoma AVM Ulcer	Diverticulosis Angiodysplasia Cancer Polyps
↓	↓	↓	↓
VASOPRESSIN 0.2 u x 20 min Maximum 0.8 u/min Recheck at 24 h	TIPS/SCLEROSIS	VASOPRESSIN Except AVM (surgery)	EMBO VS SURGERY
EMBOLIZE Gelfoam Coils			



UPPER EXTREMITY

- Atherosclerosis
- Thoracic outlet syndrome
- Vasculitis—Raynaud’s or Buerger’s
- AVM
- Trauma



LOWER EXTREMITY

<i>Viable</i>		<i>Threatened</i>	<i>Irreversible</i>
ANGIOGRAPHY		SURGERY	AMPUTATION
<i>Embolus</i>	<i>Thrombus</i>	Bypass	
Menisci Multiple	Occlusive Collaterals		
↓	↓		
Heparin Coumadin	Thrombolysis		



7

Nuclear Medicine

Includes radiopharmaceuticals, dynamic and static nuclear imaging of pathophysiological processes, and quality control of nuclear imaging instruments.

From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

Lung Imaging

V/Q SCAN

Clinical

HIGH probability: 80% chance PE

LOW probability: 80% chance of no PE

VENTILATION

1. 20 mCi Xe-133

80 keV

Gas

T1/2 = 5 d

2. 4-5mCi Tc-99m-DTPA

140 keV

Aerosol

T1/2 = 6 h

Initial phase	30 s	-Ventilation
Equilibrium phase	3 min	-Lung volumes
Washout phase	3 min	-Exclude obstructive disease

PERFUSION

4 mCi Tc-99m-MAA (10-40 μ)

1 million particles

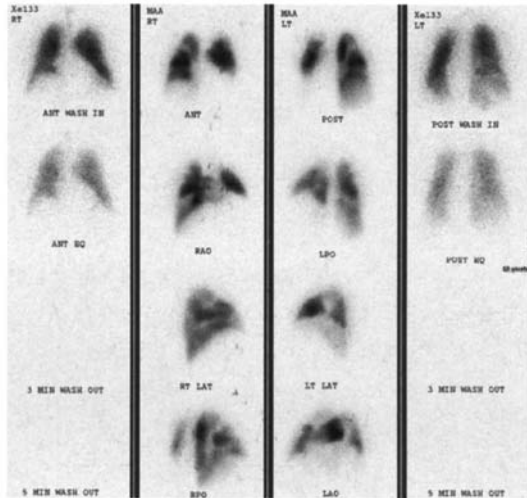
T1/2 = 6 h

Defect Size

- Small <25%
- Moderate 25–75%
- Large >75%

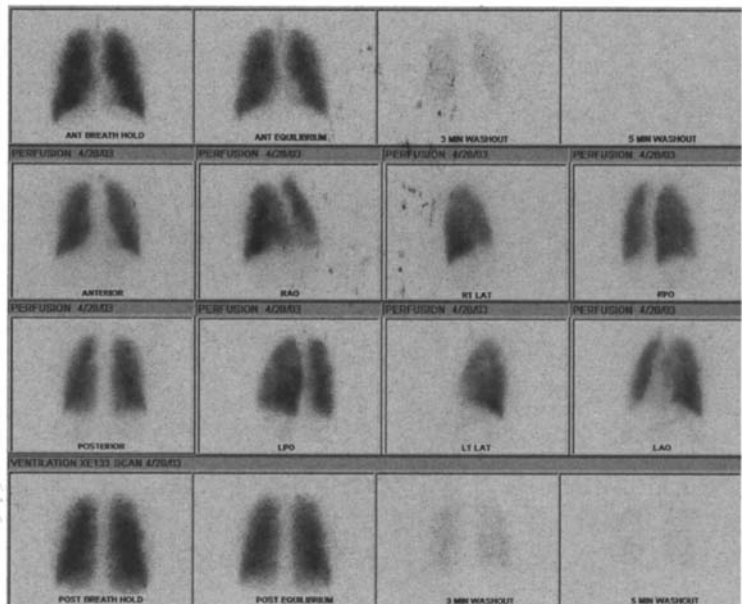
High Probability

2 large/mismatched defects or the arithmetic equivalent in moderate or large defects



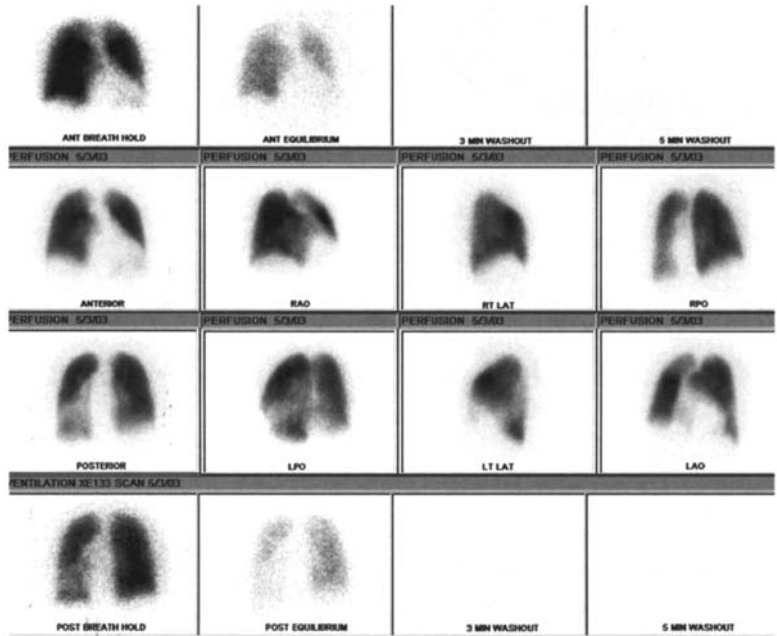
Intermediate Probability

1 large/2 moderate mismatched perfusion defects or the arithmetic equivalent in large and moderate defects



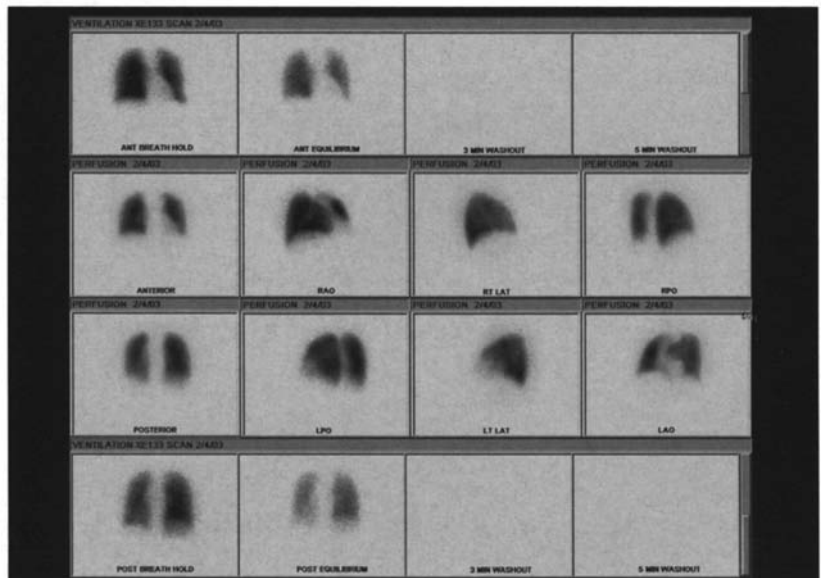
Low Probability

>3 small defects



Very Low Probability

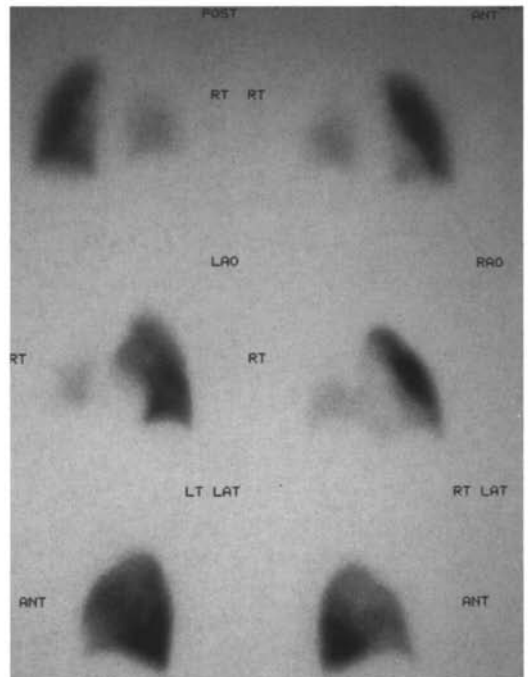
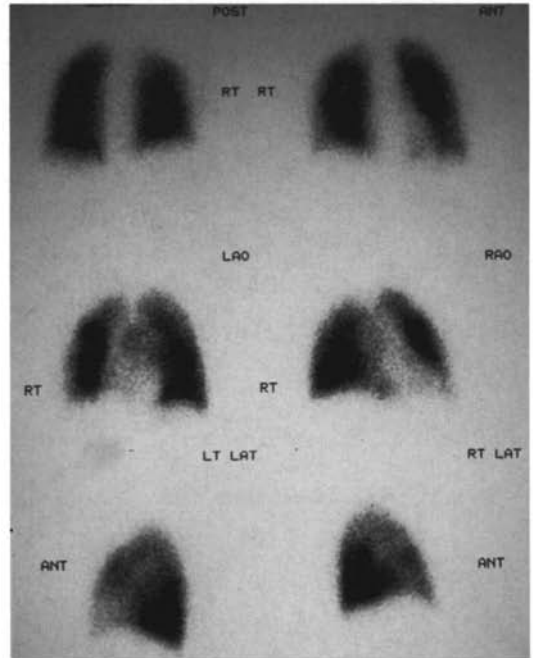
Nonsegmental defects (i.e., cardiomegaly, prominent hila, enlarged aorta), >2 matched defects



V/Q MISMATCH

DDX

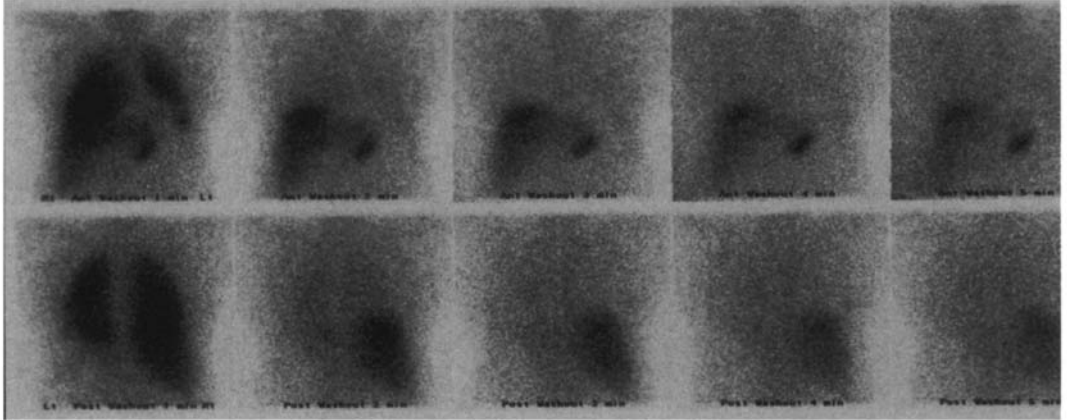
1. Primary vascular disease (vasculitis)
2. Radiation therapy
3. PE/previous embolus
4. Lymph nodes/Hilar carcinoma/sarcoma/lymphoma



LIVER UPTAKE

Early: Fatty liver

Late: Right heart failure



Endocrine

THYROID

Approach

1. Palpable or nonpalpable nodule → nodule evaluation study
2. Clinical: Hyperthyroid? → radioactive iodine uptake study
3. Malignancy: Metastatic disease? → metastatic search

1. RADIOACTIVE IODINE UPTAKE STUDY

I-123
 200-300 uCi
 24-h uptake
 N10-30%

2. THYROID SCAN

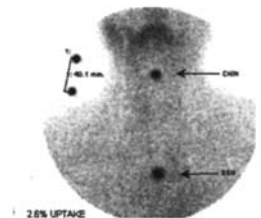
FUNCTIONAL

Hyperthyroid

1. Graves/Hashimoto's thyrotoxicosis
 Diffuse increased uptake



2. Subacute thyroiditis
 Diffuse decreased uptake

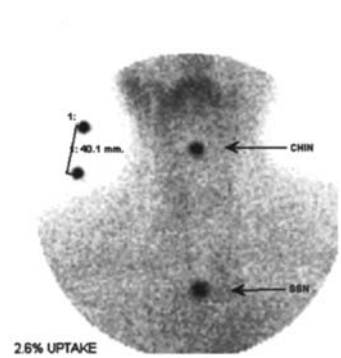


- 3. Toxic/Multinodular (Plummer)
Nodule uptake
- 4. Painless, Postpartum



Hypothyroid

- Hashimoto's
- Surgery
- Radiation



Nodule Evaluation

I-123

159 keV
 100–200 μ Ci orally
 Pinhole collimator
 Co-57 String or spot marker
 T1/2 = 9 mo

Tc-99m

140 keV
 5–10 mCi
 Pinhole or straight bore

SCAN PATTERNS

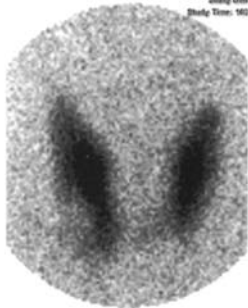
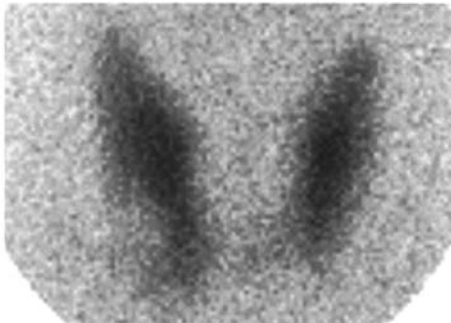
1. Normal-Diffuse Symmetric

2. Nodule

COLD

CATCH PALM

- Cancer
- Adenoma
- Thyroiditis
- Colloid Cyst
- Hematoma
- Parathyroid
- Abscess
- Lymph node/lymphoma
- Metastasis



HOT

- Functioning adenoma
- Malignancy <1% (rule out discordant)
- Multiple
 - less likely malignant



METASTATIC DISEASE

I-131

Oral

364 keV

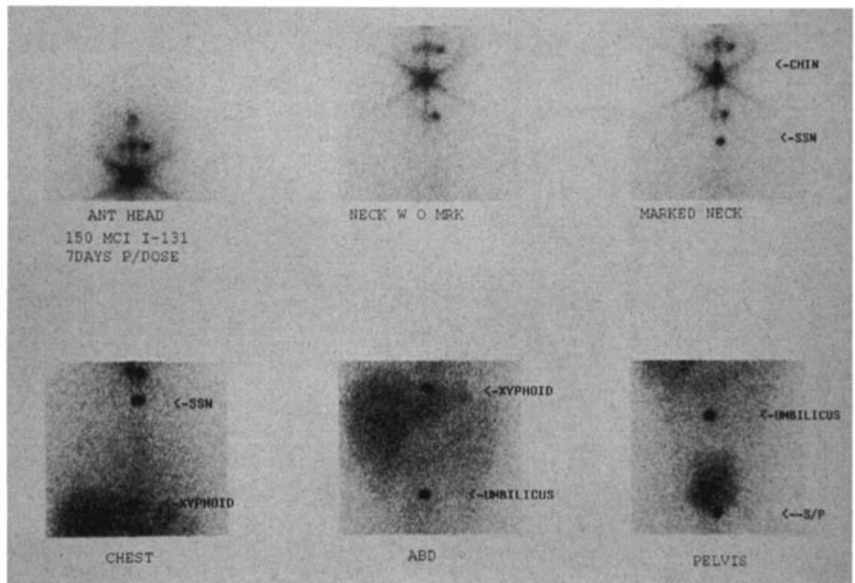
5–10 mCi-diagnosis

10 mCi-Grave's disease

100 mCi-Thyroid bed ablation

>200 mCi-Pulmonary fibrosis results

Normal uptake heart, stomach, bladder, stomach

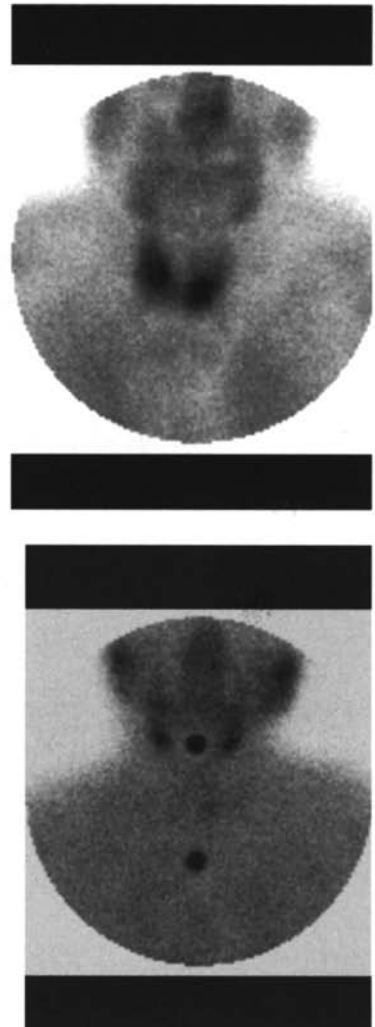


PARATHYROID SCAN

25 mCi Tc-99m Sestamibi
DUAL WITH Tc-99m (uptake in heart is a clue)
Uptake only in abnormal glands (>35-50 g)
Parathyroid adenoma-single site



Parathyroid hyperplasia-multiple sites



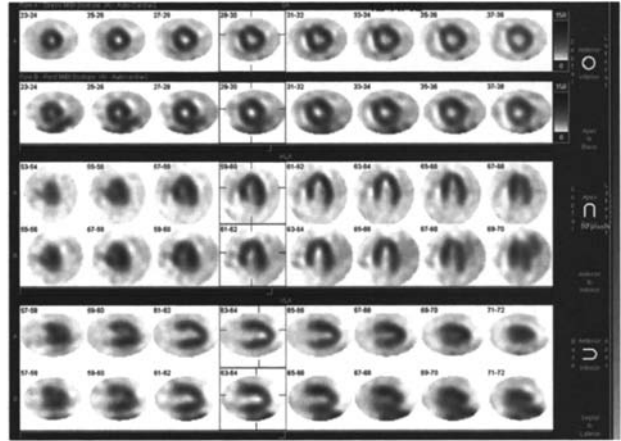
Cardiac Imaging

1. VIABILITY

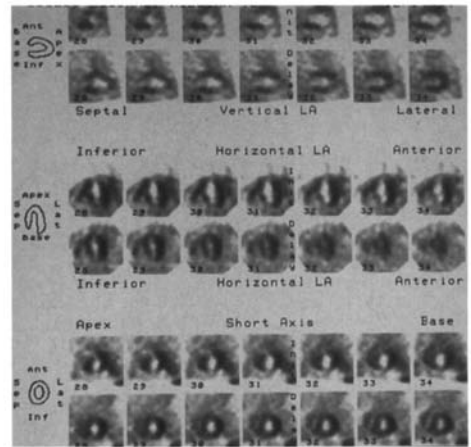
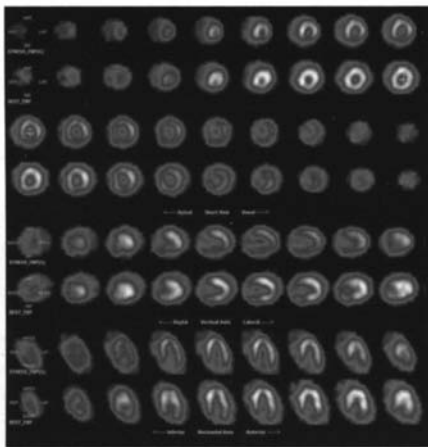
- THALLIUM
- PET

2. ISCHEMIA

- GATED
- PLANAR



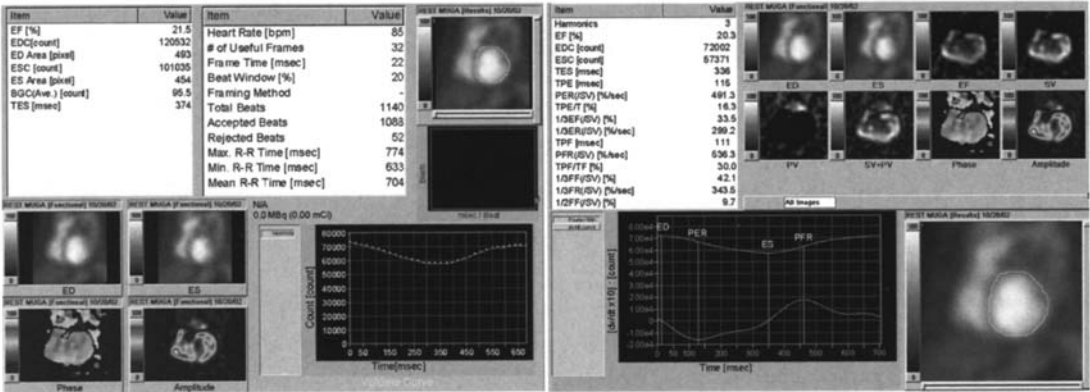
Normal



Ischemia

3. VENTRICULAR FUNCTION

- FIRST PASS
- MUGA



CARDIAC PERFUSION

PROTOCOLS

1. Thallium-201
 - Rest
 - 4 mCi
 - T1/2 = 3 d
 - 70 keV (Hg X-rays)
 - 15 min post-injection imaging
 - Exercise
 - 20 mCi Tc-99m-MIBI
 - 45 min post-injection/exercise imaging to allow clearance of liver
2. Alternates
 - 2 Step MIBI 8 Mci/24 Mci doses
 - Tc-99m Teboroxime

PHYSIOLOGY

LAD Territory

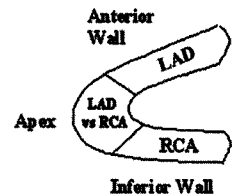
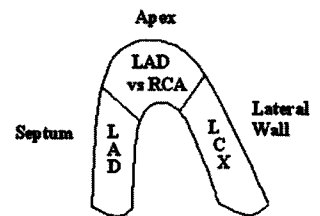
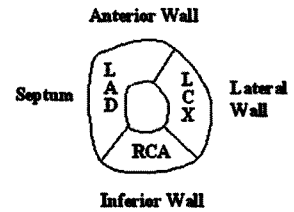
- Ant 2/3
- Apex
- Septum

RCA Territory

- Inferior wall
- Inferior apex
- Inferior 1/3 septum

L. Circumflex

- Inferolateral wall
- Inferior wall (marginals)



Inflammatory Imaging

IN-111 WBC SCAN

500 uCi

172, 247 keV

Medium Energy Collimator

Image at 24 h or 6 h/24 h

T1/2 = 3 d

Indications

1. Fever of unknown origin
2. Infection
3. IBD F/U



GA-67 SCAN

5 mCi
 90, 190, 290, 390 keV
 Medium Energy Collimator
 Image 24 h, 48 h
 $T_{1/2} = 3 \text{ d}$

Indications

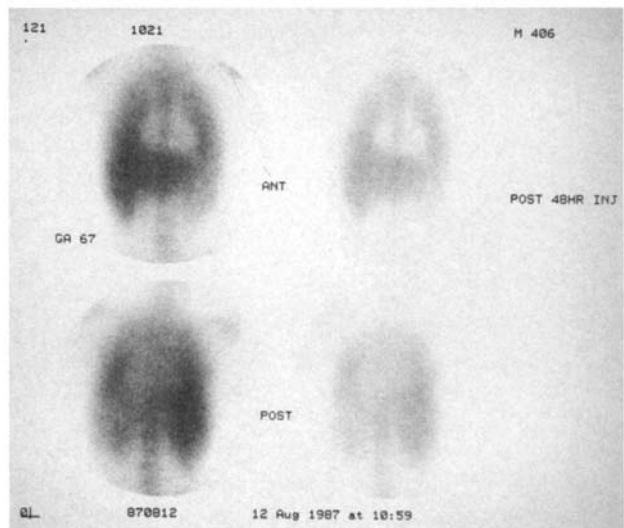
LISA

Lymphoma
 Infection (Lung)(MAI)
 Sarcoid
 Abscess



INFECTION/INFLAMMATORY DDX

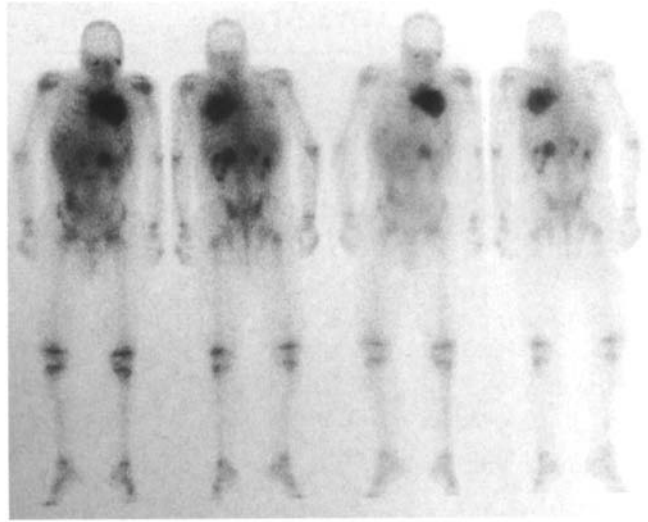
1. Lung-sarcoid
2. Lung-Pneumonitis
3. Abscess/Cellulitis/Osteomyelitis



TUMOR DDX

1. Lymphoma
2. HCC
3. Sarcoma
4. Melanoma
5. Testicular Carcinoma

NB: No Uptake in KAPOSI



Neurological Imaging

BRAIN SCANNING

Tc99m HMPAO

Tc-99m ECD

20 mCi

140 keV

T1/2 = 6 h

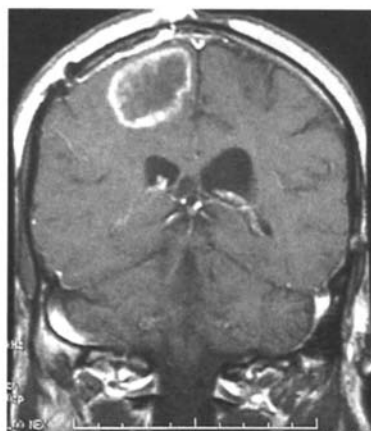
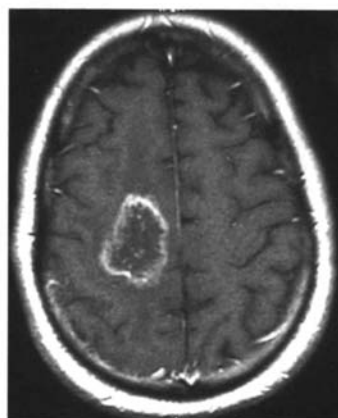
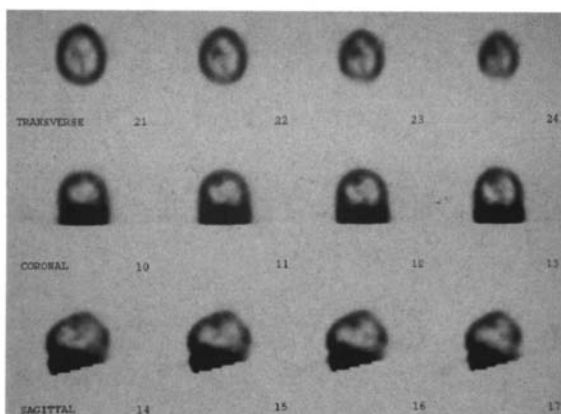
Indications

1. Stroke—defect
2. Dementia
3. Epilepsy
4. Brain death
5. Tumor

Tl-201 (will see Orbit uptake)

a) Lymphoma (+) vs Toxo (–)

b) Tumor (uptake) vs Necrosis (no uptake)



CSF

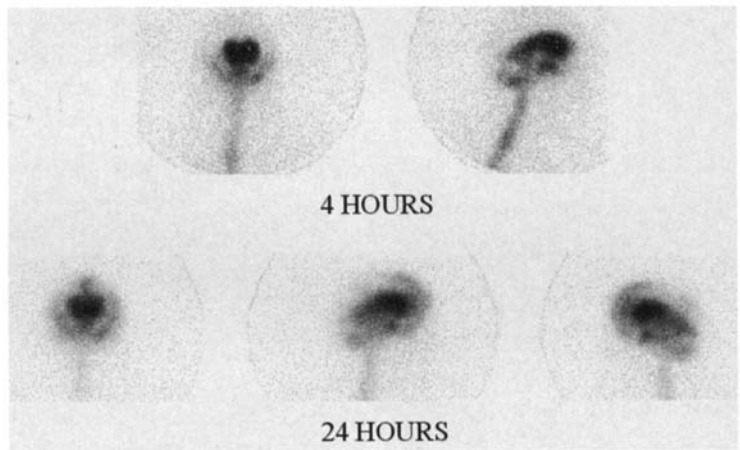
In-111 DTPA

500 uCi

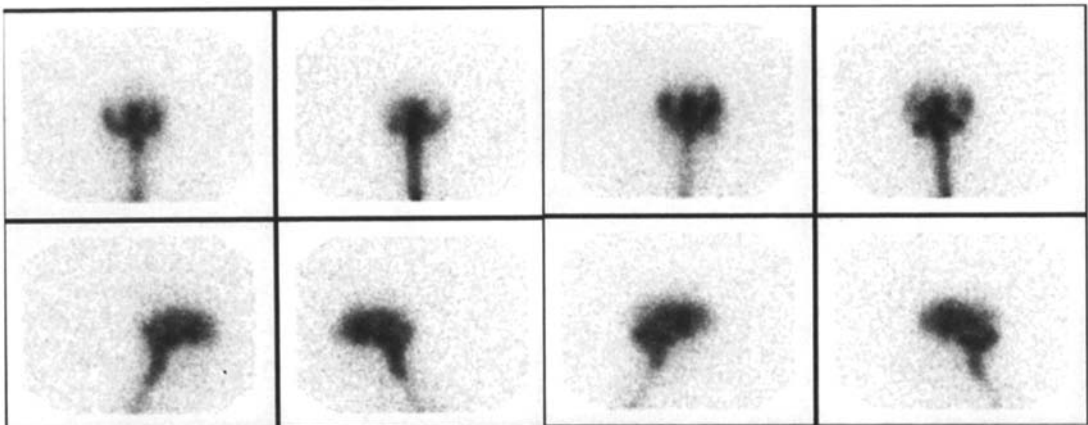
174/247 keV

Indications

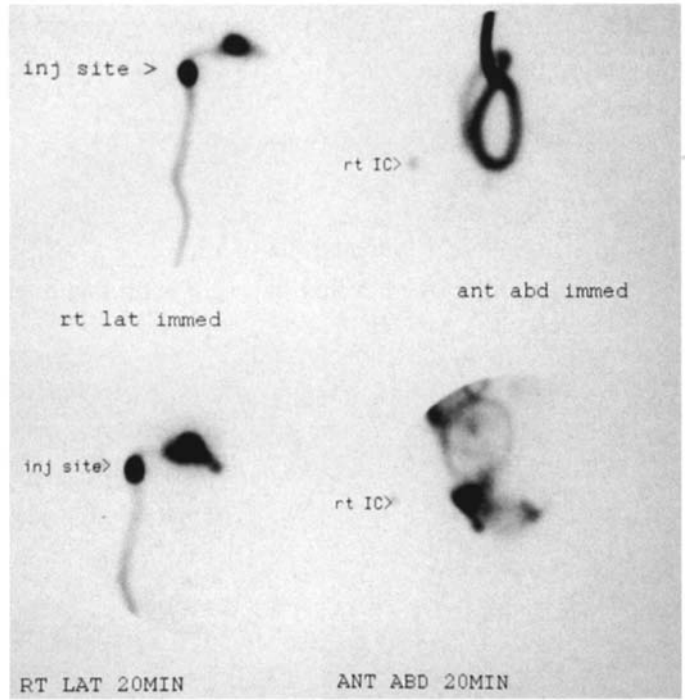
1. Dementia–NPH–immed/4 h/24/48 h
 - Early filling with reflux into ventricles abnormal (no normal reflux into ventricles)
 - Delayed clearance



2. CSF LEAK



3. CSF SHUNT



Gastrointestinal Imaging

GALLBLADDER/LIVER

Tc-99M DISIDA

Tc-99m MEBROFENIN

5 mCi

NPO after midnight

Q5 min × 60 min, then Q1min/frame

All purpose collimator

T1/2 = 6 h

Evaluation

1. Does the patient have a gallbladder?
2. Prompt hepatic uptake? Peak uptake? Distribution?
3. Appropriate blood pool washout?
4. Prompt excretion into intra and extra hepatic ducts?

POTENTIAL SCENARIOS

1. *Bile Duct Obstruction*

Normal state:

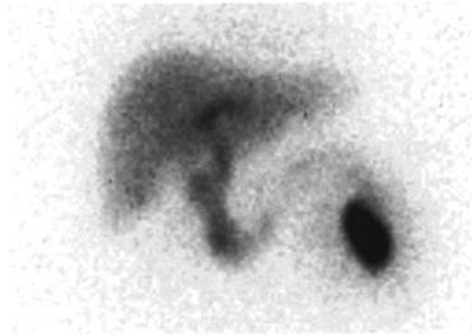
Uptake in liver	5-10 min
CBD	10 min
GB	60 min
Intestinal	60 min

Any delay beyond this is indicative of obstruction

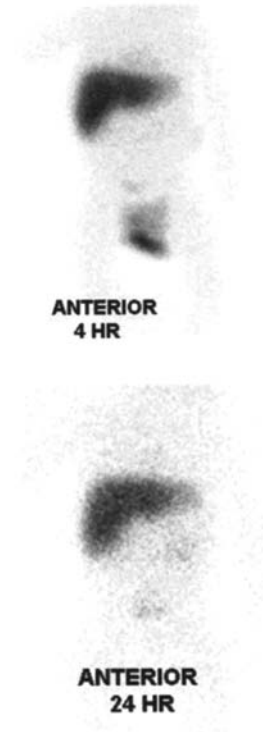
2. *Acute Cholecystitis*

Augment study by giving:

- Morphine 0.04 mg/kg
- Sincalide 1–2 μ g slow i.v. 30 min
- Delay 4–6 h

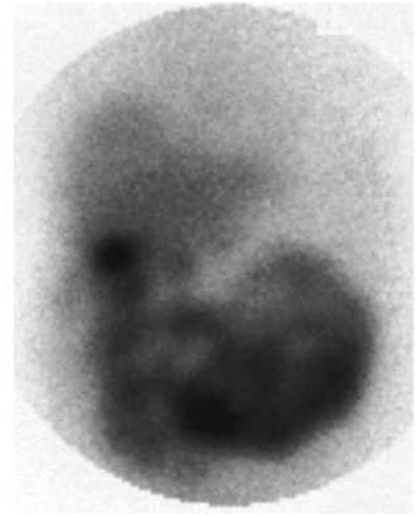


3. *Biliary Atresia*



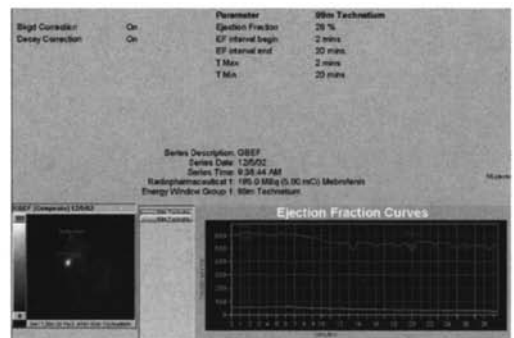
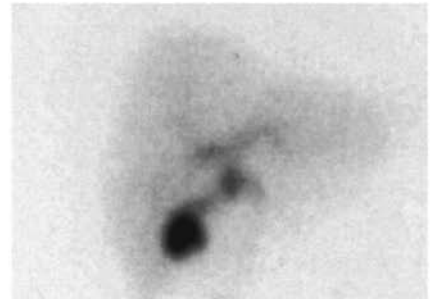
4. Biliary Leak

- Cystic duct remnant
- Choledochocoele
- Bowel



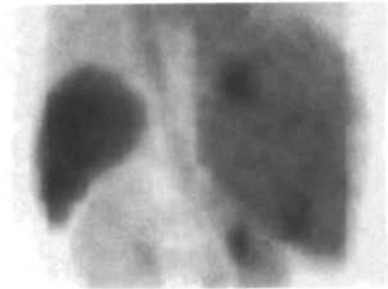
5. GB Ejection Fraction

- Sincalide 0.02 µg/kg
- a. Dyskinesia
- b. Normal = >30% at 30 min

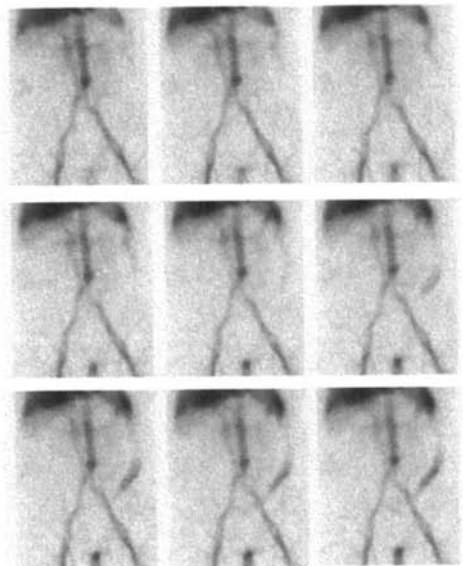


LIVER/SPLEEN

Tc-99m Sulfur colloid
4 mCi
20 min after injection
All purpose
Planar images

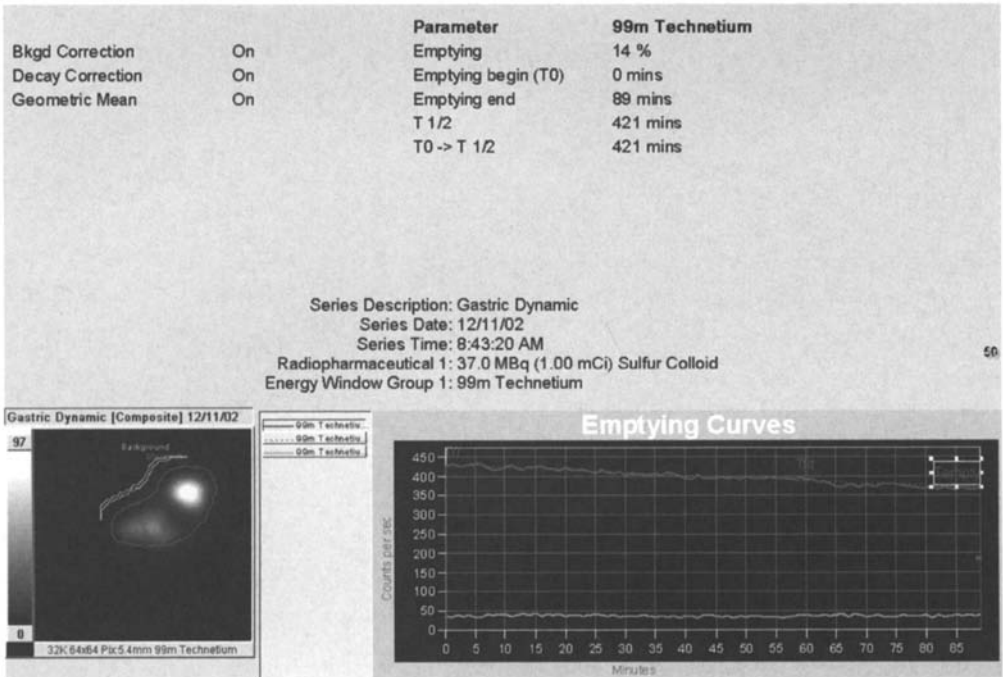
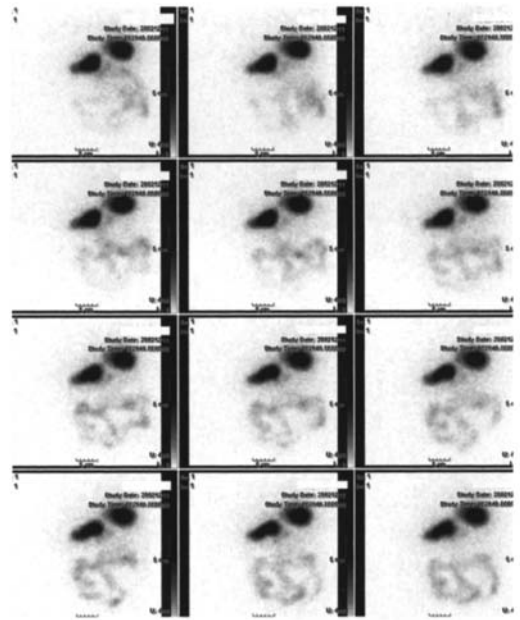
**GI BLEEDING**

Tc-99m Sulfur colloid 8 mCi
Tc-99m Pertechnate labeled RBC 20 mCi
Q1 min/1 h
Requires active bleeding



GASTRIC EMPTYING

Tc-99m Sulfur colloid 0.5 mCi



Neuroendocrine Imaging

I-123/I-131 MIBG SCAN

5 mCi (I 123)

0.5-1mCi (I131)

24-h imaging

159/364 keV

Low count images due to dose

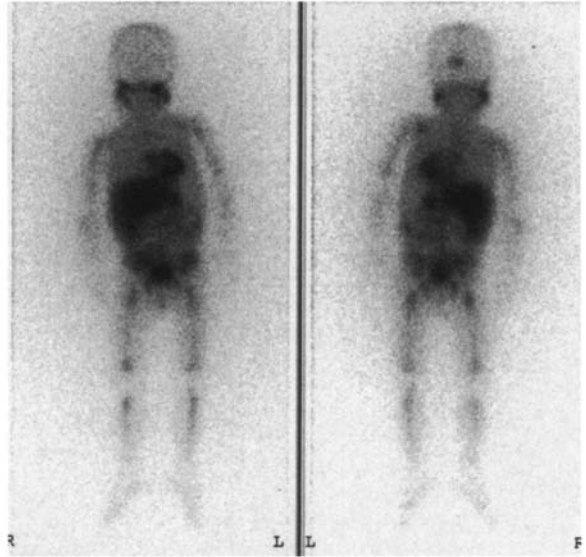
Normal uptake in bladder,

thyroid (if not blocked),

heart, stomach, liver, spleen

No bone uptake

Abnormal uptake in other regions



I-111 PENTRETOTRIDE/OCTREOTRIDE SCAN

Uptake in liver, spleen, and both kidneys

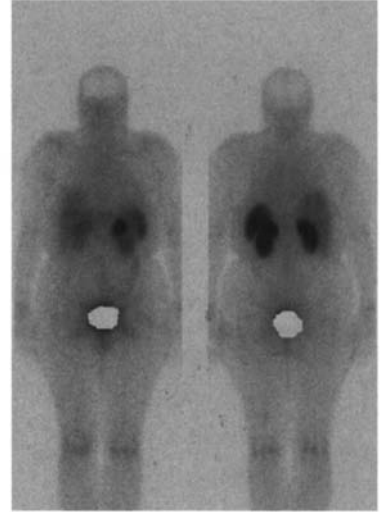
Whole body images obtained

5 mCi

24-h imaging

172/247 keV

Primarily used for carcinoid and endocrine tumors



Renal Imaging

RENAL SCAN

Tc-99m MAG 3: 5 mCi

Tc-99m DTPA: 15 mCi

Tc-99m DMSA: 5 mCi

Indications

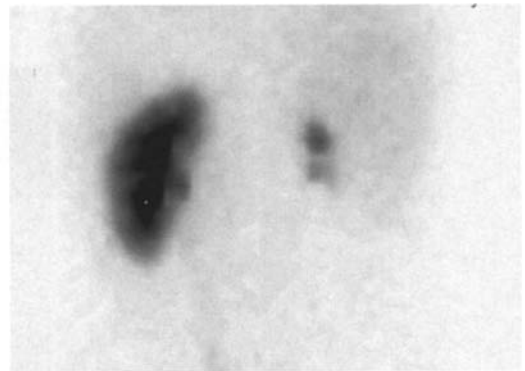
<i>Nontransplant</i>	<i>Transplant</i>
----------------------	-------------------

- | | |
|-----------------|-----------|
| 1. Obstruction | Viability |
| 2. Function | |
| 3. Hypertension | |

Evaluation

1. FLOW-Peak kidney uptake at 6 s equal to aortic uptake
2. FUNCTION
 - a. Uptake
 - b. Distribution
 - c. Excretion (Prompt?)
 - d. Symmetry
 - e. Gradual washout
 - f. Tracer in bladder

Lasix administration should cause 50% drop after 10 min



RADIONUCLIDE VCUG SCAN

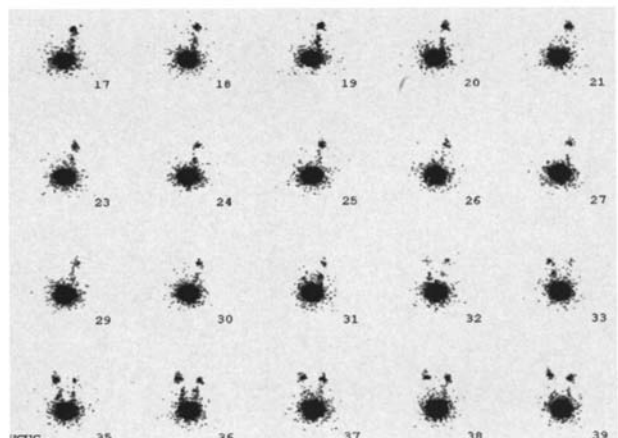
Tc-99m DTPA: 10 mCi

Reflux:

Grade I: Ureter

Grade II: Collecting system

Grade III: Severe



Musculoskeletal Imaging

SINGLE-PHASE BONE SCAN

Tc-99m-MDP: 10 mCi

3-h delay to allow soft tissue washout

HOT FOCI-INCREASE UPTAKE

Metastatic disease

Tumor

Trauma

Insufficiency

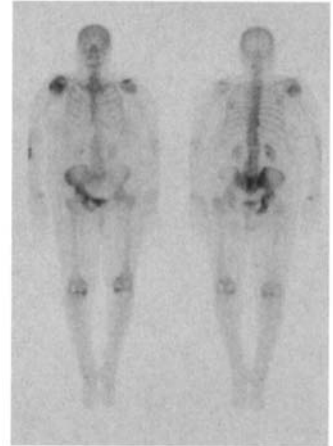
Pathological

Trauma

Pagets

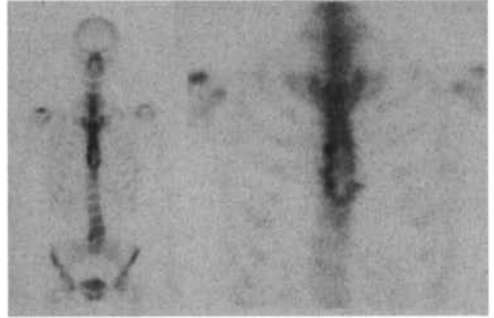
Arthritis

Osteomyelitis

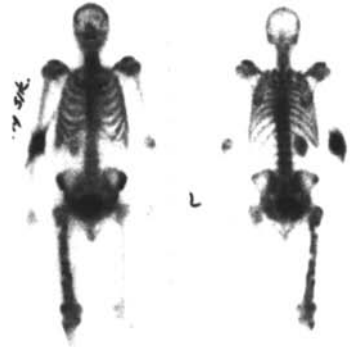


COLD FOCI: DECREASED UPTAKE

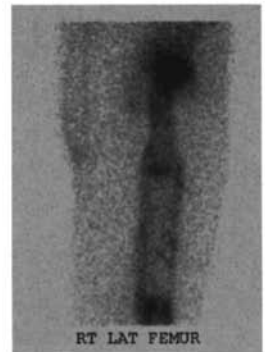
Myeloma



Renal cell/thyroid metastasis



- Bone cysts
- Infarcts/AVN
- Hardware
- Abscess
- Artifact



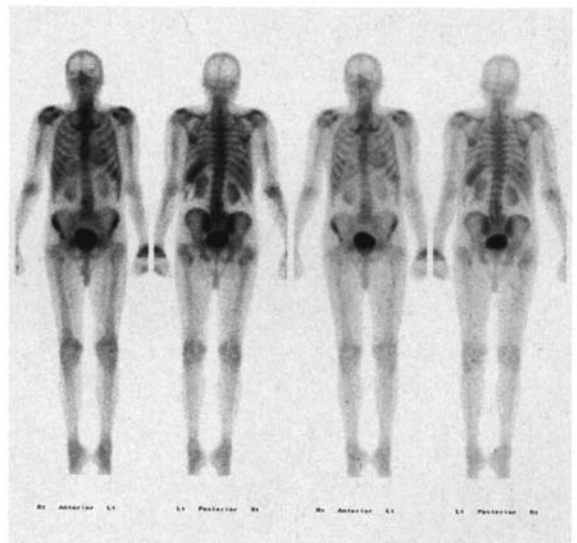
SUPERSCAN

Metastatic disease
HPTH
Osteomalacia severe



LIVER UPTAKE

Metastatic
Previous radionuclide administration
Aluminum contamination
Amyloidosis



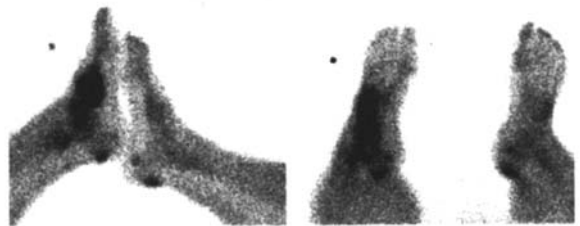
THREE-PHASE BONE SCAN

Indications

1. Reflex sympathetic dystrophy
(flow at 2 mo normal, blood pool at 6 mo normal).
2. Infection



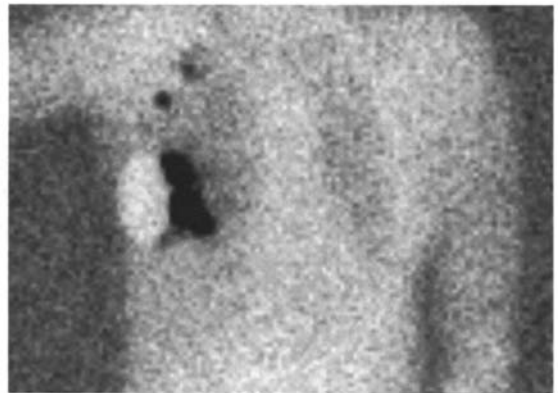
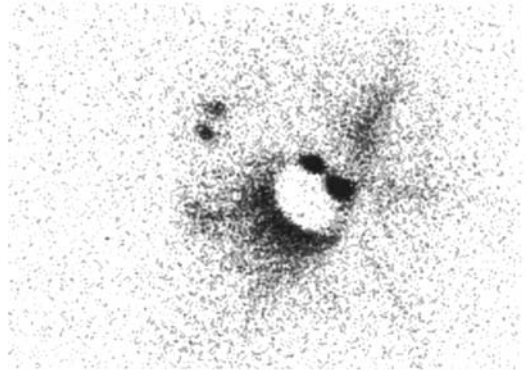
3. Neuropathic joint



Other

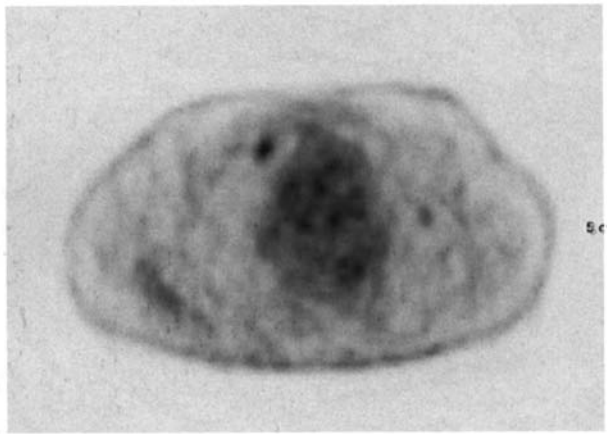
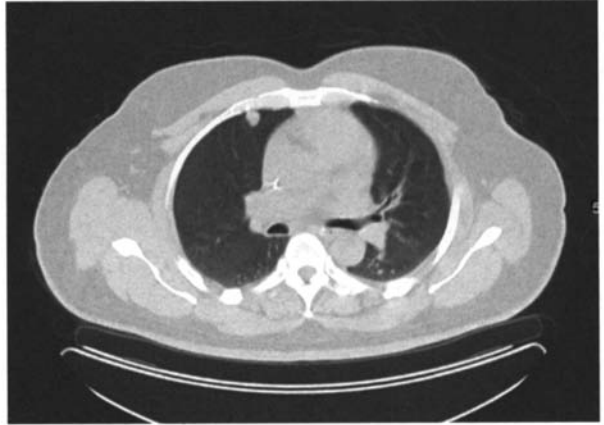
SENTINEL NODES SCAN

100 μ Ci filtered Tc-99m Sulfur colloid
Intradermal injections \times 4
0.1 cc/injection
Flow images at 10 s/frame \times 10 min
Co-57 transmission images are combined
IMAGE ALL BEDS: Chest, Abdo, etc...
2-5 nodes typical



PET

10 mCi F-18 FDG
T1/2= 110 min
511 keV annihilation photons
Image at 1 h
Attenuation correction



8

Ultrasound

Includes ultrasound imaging and Doppler ultrasound of the head and neck, thorax, abdomen, pelvis, extremities, breast, scrotum, and the vascular system as well as ultrasound evaluation of the fetus pregnant uterus.

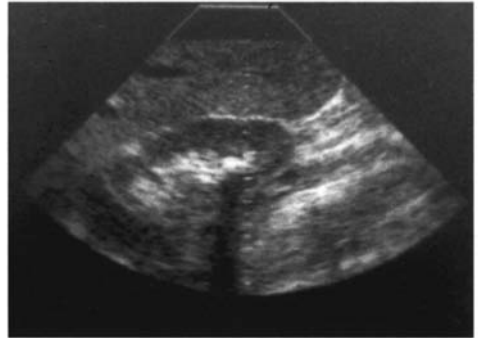
Note: Ultrasound is a different section than the other categories in that it is based on a modality rather than a subspecialty. Therefore, the cases are based on ultrasound findings rather than subspecialty entities. The following differentials are based on that principal.

ULTRASOUND FINDINGS

ECHOGENIC

Fat

Calcium—shadowing

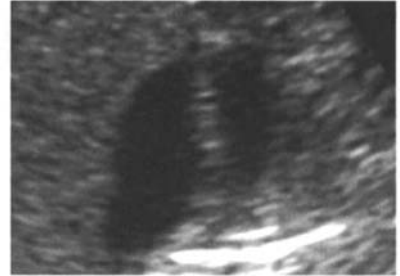


Blood

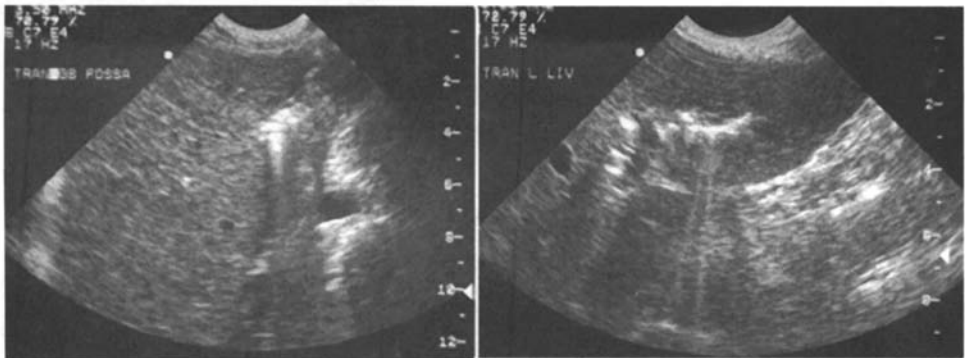


RING DOWN OR COMET-TAIL

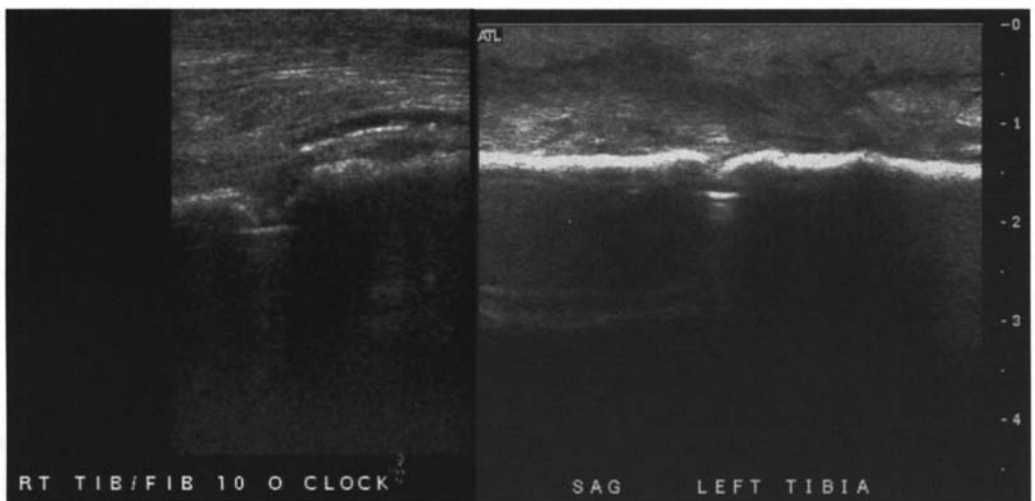
Cholesterol in the Rokitansky-Aschoff sinuses of gallbladder



Air



Metal

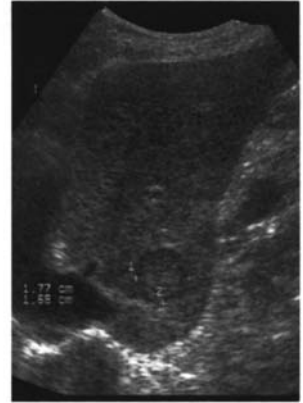


Gastrointestinal Ultrasound

LIVER

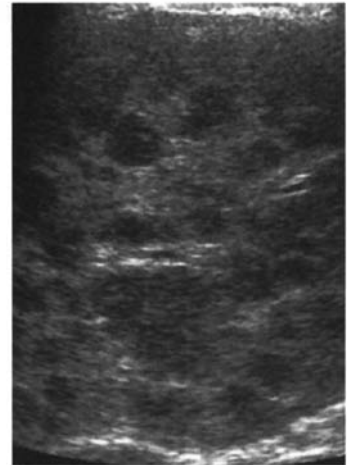
SOLITARY LIVER MASS

- Hepatocellular carcinoma—Cirrhosis
- Adenoma—Woman on oral contraceptive
- Focal nodular hyperplasia—Central scar
- Cholangiocarcinoma—accompanying biliary ductal dilatation
- Pyogenic abscess—Complex cystic
- Focal sparing of fatty liver—Gallbladder fossa, portal bifurcation



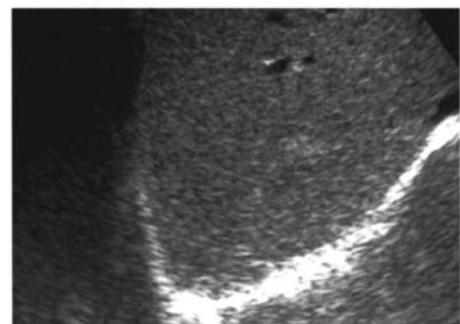
MULTIFOCAL LIVER LESIONS

- Metastases
- Microabscesses—Candida
- Other abscesses—Pyogenic, Amebic (complex cystic)



HYPERECHOIC LIVER LESIONS

- Hemangioma—MRI for confirmation
- Focal fat—next to falciform ligament in anterior aspect of segment 4, portal bifurcation
- Metastases—Mucinous such as colon or ovarian
- Any other primary liver tumor



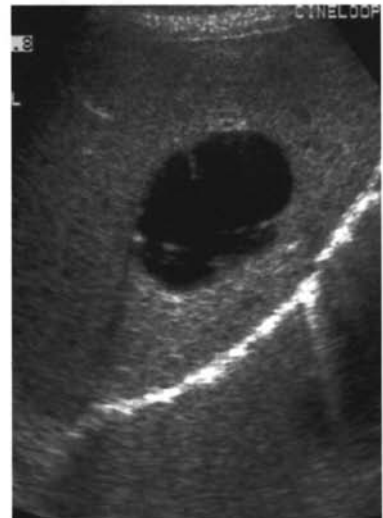
MULTIPLE CALCIFIED HEPATIC MASSES

- Stones
- Histoplasmosis
- PCP



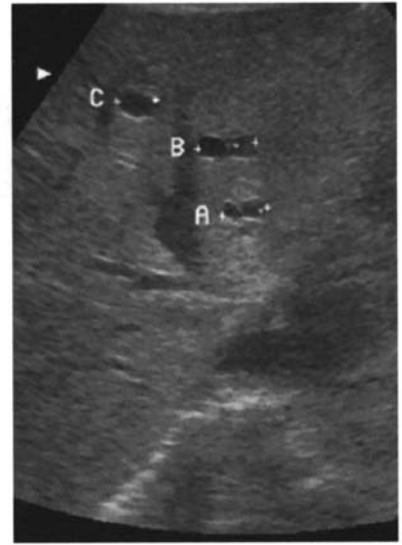
COMPLEX CYSTIC MASS

- Infection
 - Abscess—pyogenic or amebic
 - Echinococcus
- Tumor
 - Cystic metastases—ovarian
 - Biliary cystadenoma
 - Hemorrhagic mass—e.g., adenoma (solitary)
 - Necrotic metastases—sarcoma
- Trauma
 - Hematoma (solitary)
 - Biloma (solitary)



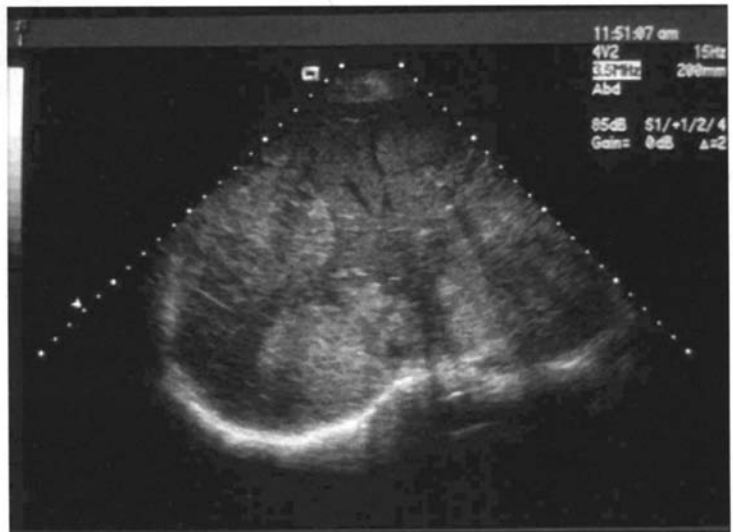
MULTIPLE SIMPLE CYSTS

- Cysts
- Caroli's



DIFFUSE INHOMOGENEOUS LIVER ECHOTEXTURE

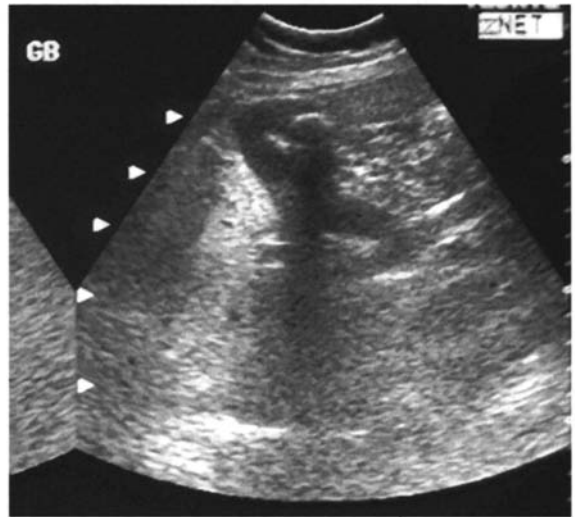
- Cirrhosis—ascites, surface nodularity
- Metastases
- Fatty infiltration—loss of portal triad hyperechogenicity
- Lymphoma
- Kaposi in immunocompromised



GALLBLADDER

SMALL INTRALUMINAL GALLBLADDER LESIONS

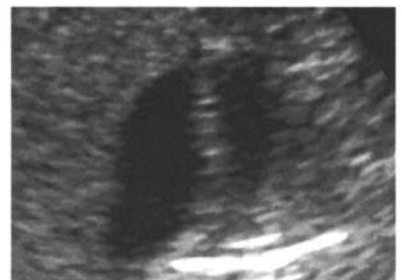
Stones—shadow, mobile



Cholesterol polyps—No shadow, not mobile

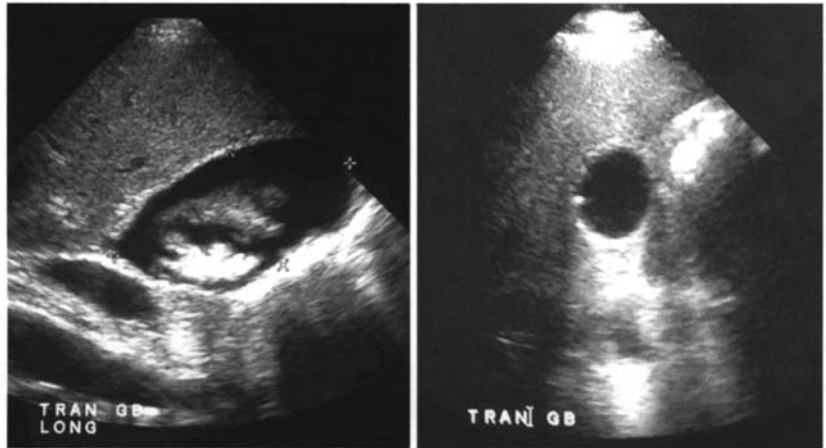


Cholesterol crystals—ring-down, not dependent



GALLBLADDER MASSES

- Polyp—<1 cm
- Tumefactive sludge—mobile
- Focal adenomyomatosis
- Chronic cholecystitis
- Gallbladder carcinoma
- Metastases—melanoma

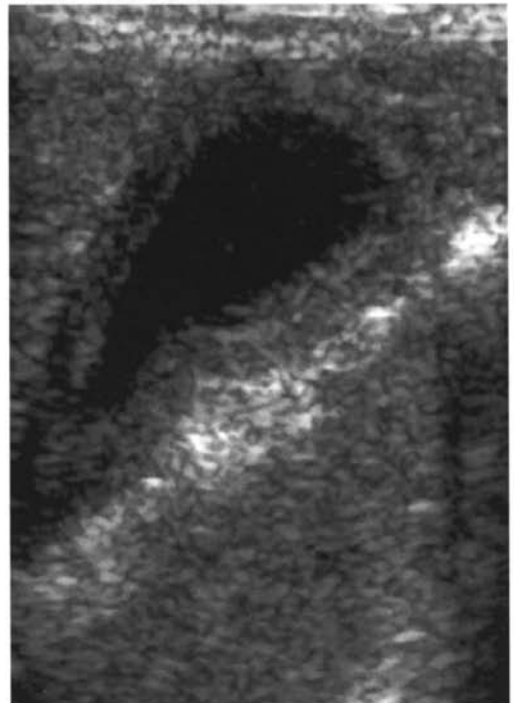


GALLBLADDER WALL THICKENING (MANY CAUSES)

Biliary—cholecystitis, adenomyomatosis, AIDS cholangitis

Edema—hypoproteinemia (cirrhosis, nephrotic syndrome), congestive heart failure

Hepatitis

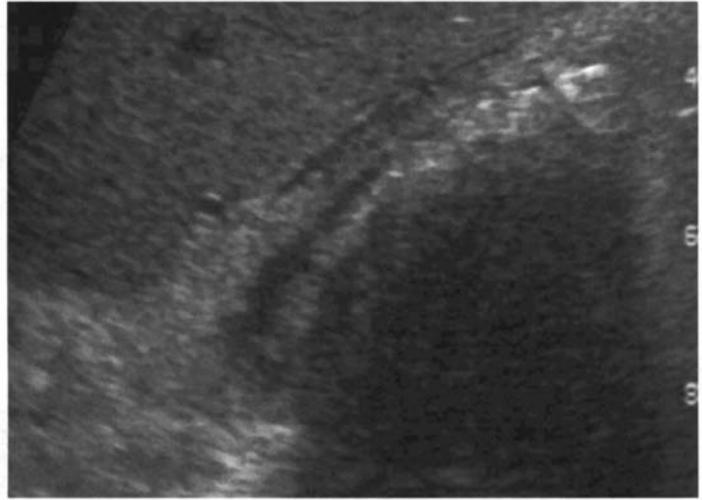


SHADOWING IN THE GALLBLADDER FOSSA

WES of stones

Porcelain gallbladder—must be removed because of increase risk of carcinoma

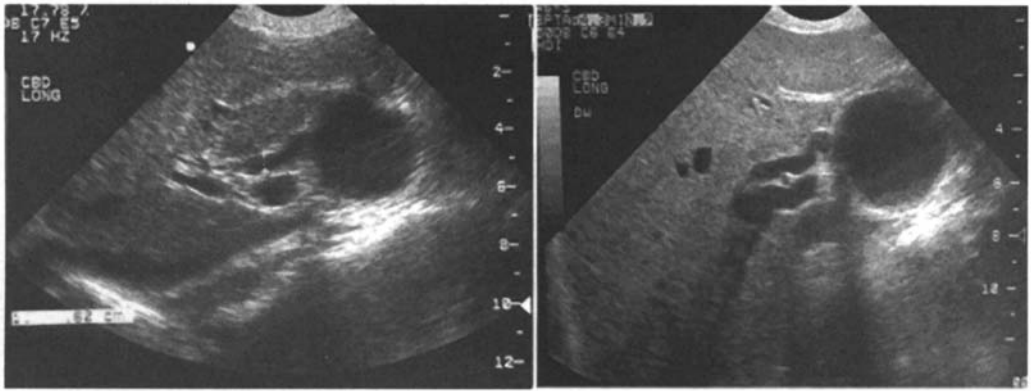
Emphysematous cholecystitis



BILIARY DUCTS

CYSTIC STRUCTURE IN REGION OF CBD

- Choledochal cyst
- Duodenal duplication
- Mesenteric cyst
- Pancreatic pseudocyst



BILIARY DUCTAL WALL THICKENING

Cholangitis

Sclerosing—also see strictures

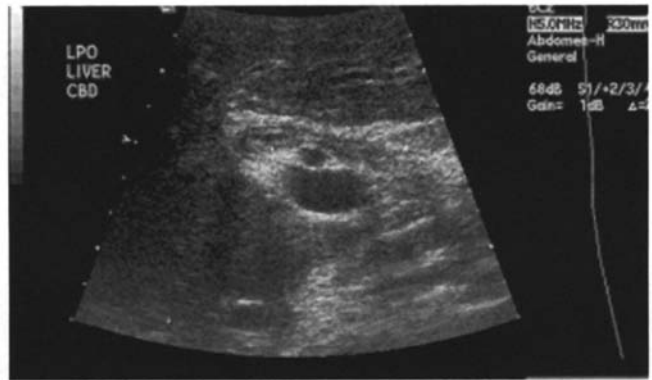
AIDS cholangiopathy—looks exactly like sclerosing cholangitis

Oriental cholangiohepatitis—stones

Ascending

Cholangiocarcinoma

Pancreatitis



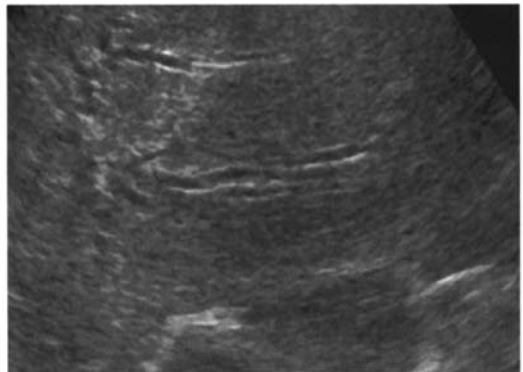
INTRAHEPATIC BILIARY DUCTAL DILATATION

Stone

Benign stricture—chronic pancreatitis

Pancreatic head mass

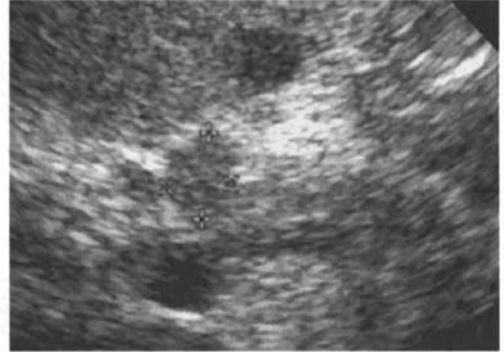
Klatskin tumor



PANCREAS

SOLID PANCREATIC MASS

- Adenocarcinoma
- Focal pancreatitis—calcifications
- Lymphoma
- Metastasis
- Islet cell tumor
- Peripancreatic lymph node



CYSTIC PANCREATIC MASS

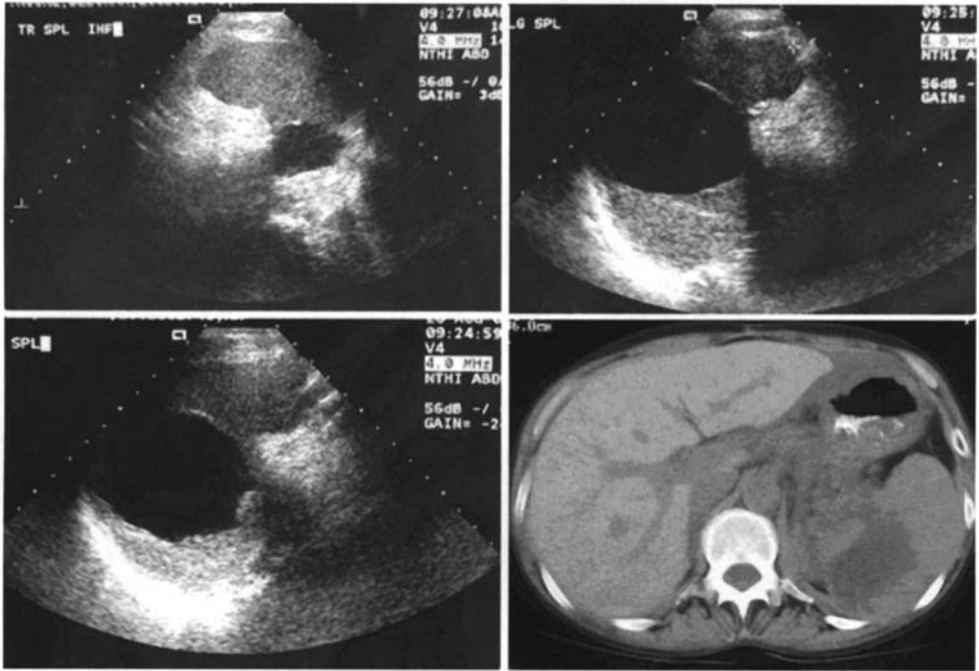
- Pseudocyst
- Macrocytic = mucinous cystadenoma/ carcinoma (middle-aged women)
- Microcystic = serous cystadenoma (middle-aged women)
- Solid and papillary epithelial neoplasm (young women)
- IPMT—dilated side branches, 85% malignant
- Aneurysm or pseudoaneurysm (pancreatitis)



CYST ADJACENT TO MEDIAL ASPECT OF SPLEEN

Pancreatic pseudocyst

Renal cyst



SPLEEN

CYSTIC SPLENIC MASS

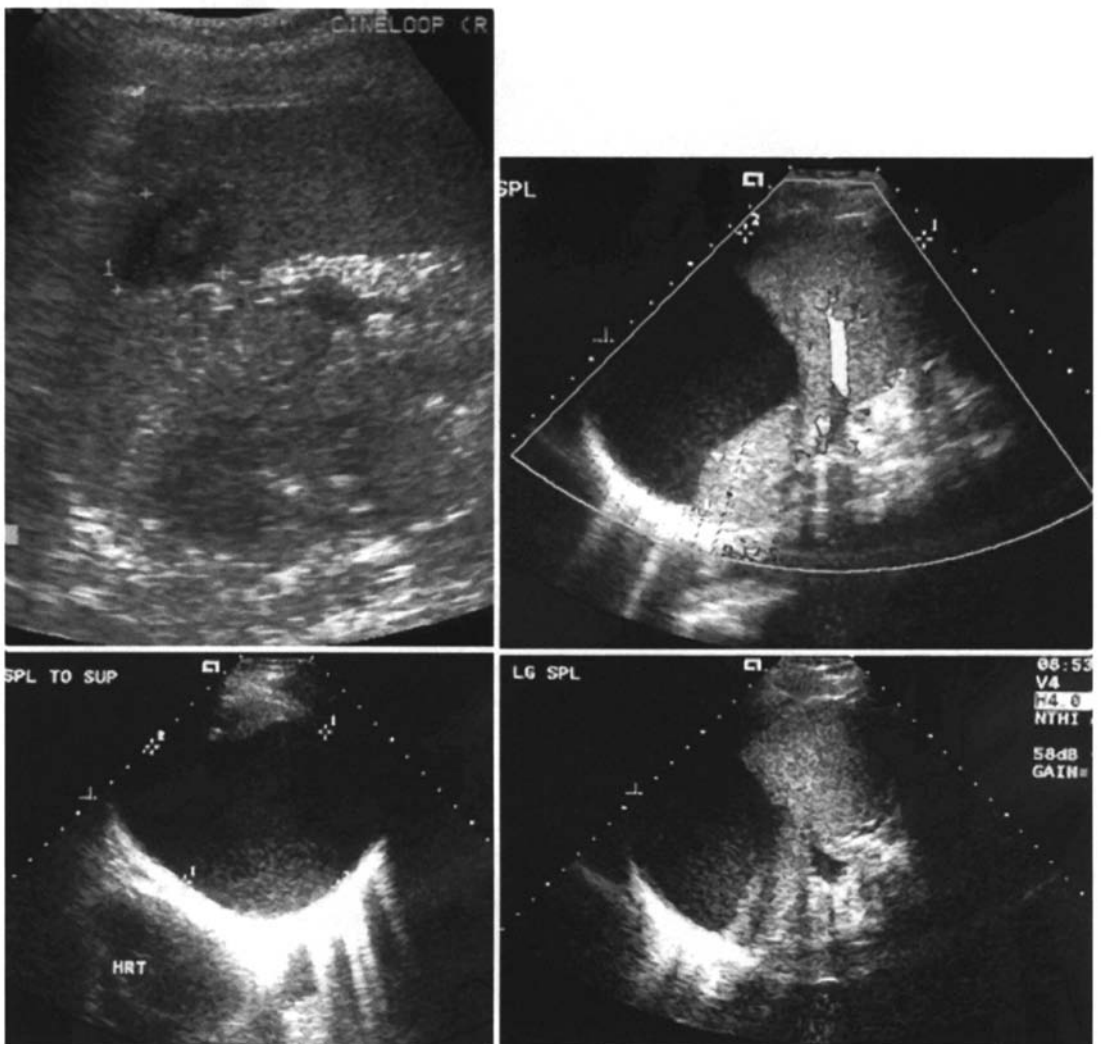
Pseudocyst—acquired from prior trauma or infarct; most common

Epidermoid cyst—congenital

Lymphangioma

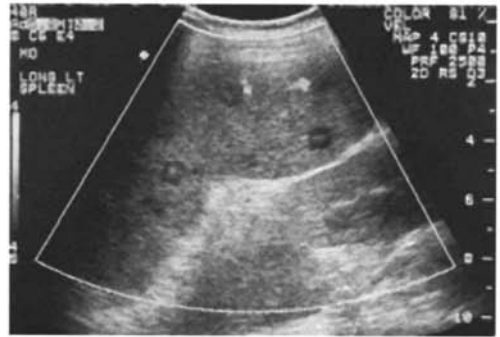
Hematoma

Abscess



SOLID SPLENIC MASS

- Hemangioma—hyperechoic
- Lymphoma—may be multiple
- Infarct—wedge shaped
- Abscess—Candida gives multiple microabscesses
- Sarcoidosis—multiple



SPLENOMEGALY

- Portal hypertension
- Splenic vein thrombosis
- Leukemia/lymphoma
- Mononucleosis
- Glycogen storage disease
- Myelofibrosis

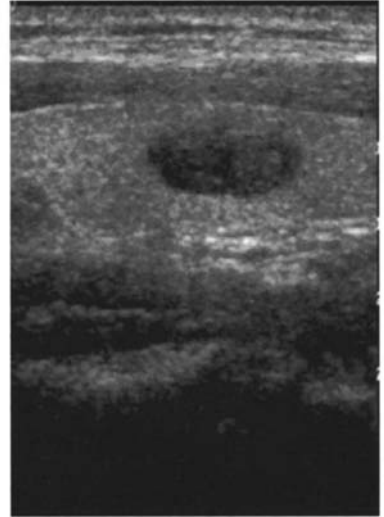


THYROID

THYROID MASS

CATCH

- Carcinoma—microcalcifications
- Adenoma
- Thyroiditis
- Colloid Cyst
- Hyperplasia (Parathyroid gland)



Genitourinary Ultrasound

KIDNEY

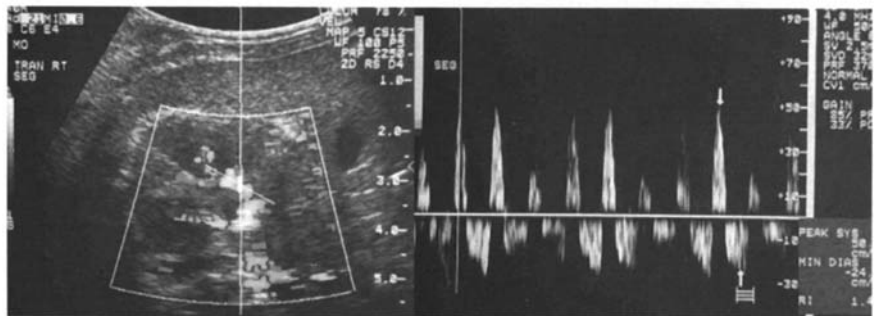
HYDRONEPHROSIS

- Obstruction
- Reflux
- Active diuresis
- Congenital megacalyces



RI >0.7

- Acute tubular necrosis
- Renal vein thrombosis
- Obstruction
- Complication in transplanted kidney = rejection, perinephric collection, cyclosporin toxicity



MEDULLARY NEPHROCALCINOSIS

- Renal tubular acidosis
- Medullary sponge kidney
- Hyperparathyroidism



CORTICAL NEPHROCALCINOSIS

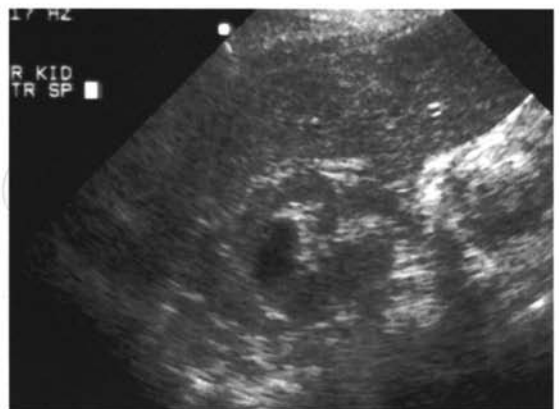
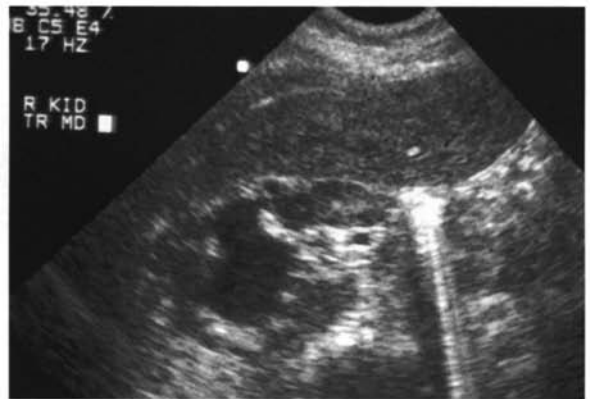
- Chronic glomerulonephritis
- Healed pyelonephritis
- XGP
- TB



PAPILLARY NECROSIS

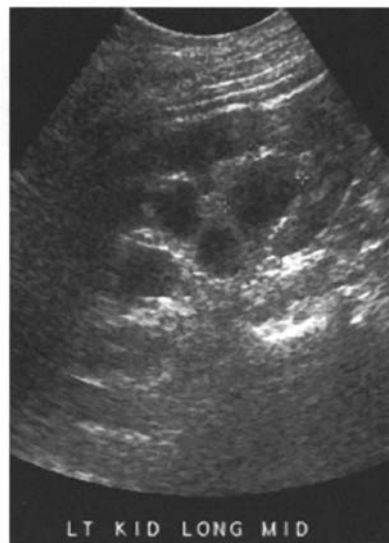
NSAID

- NSAID
- Sickle cell
- Analgesics
- Infection (TB)
- Diabetes



CYSTIC STRUCTURES ADJACENT TO RENAL HILUM

Hydronephrosis
 Peripelvic cysts
 Papillary necrosis
 Dilated renal vein



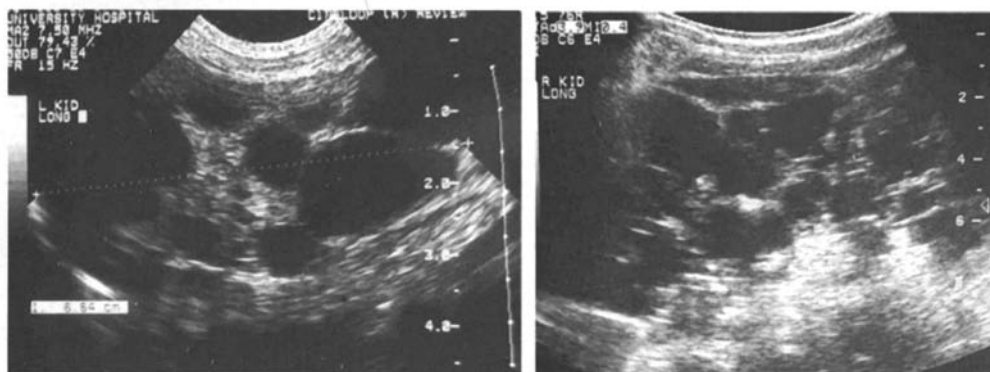
BILATERAL MULTIPLE RENAL CYSTS

Acquired cystic disease of dialysis—small kidneys, increased risk of RCC

ADPKD—enlarged kidneys, liver cysts, berry aneurysms

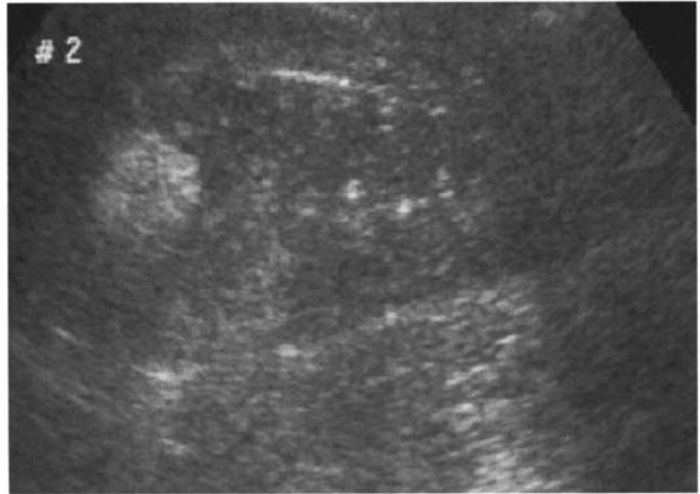
Von-Hippel Lindau—pancreatic cysts, increased risk of RCC, CNS hemangioblastomas, pheos

Tuberous sclerosis in kids—AMLs, cortical tubers, giant cell astrocytomas, periventricular nodules, cardiac rhabdomyomas, pulmonary LAM



HYPERECHOIC RENAL MASS

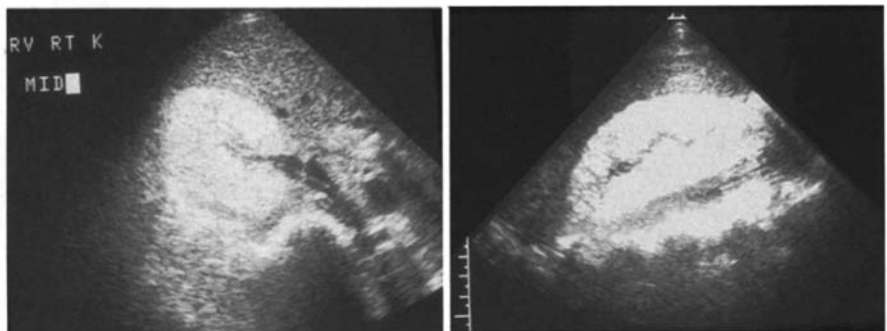
- Stone (shadow)
- AML
- RCC
- Lobar nephronia



ECHOGENIC KIDNEYS

GLAD

- Glomerulonephritis
- Lupus
- AIDS
- Diabetes



SOLID RENAL MASS

Tumor

RCC

Lymphoma or mets—multiple

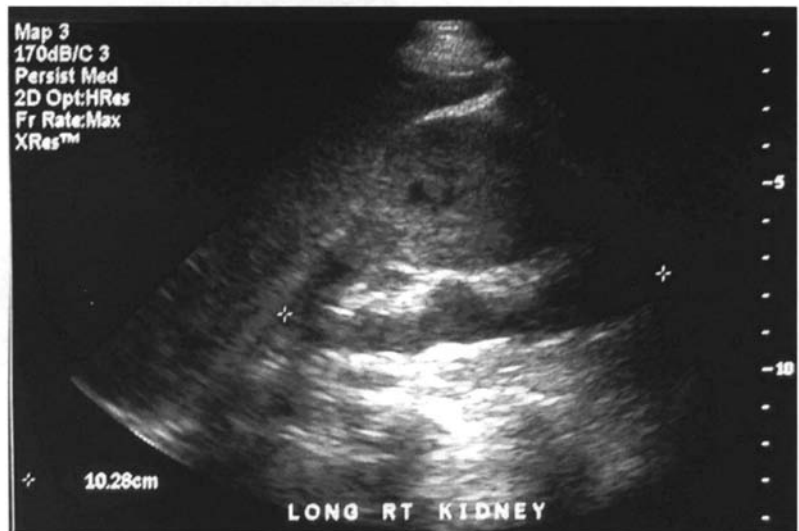
AML—hyperechoic

Oncocytoma—central scar

Lobar nephronia

Hypertrophic column of Bertin—extend into renal sinus

Focal parenchymal hypertrophy in atrophic kidney



COMPLEX CYSTIC RENAL MASS

Tumor—RCC, multilocular cystic nephroma

Hemorrhage into cyst

Abscess—fever

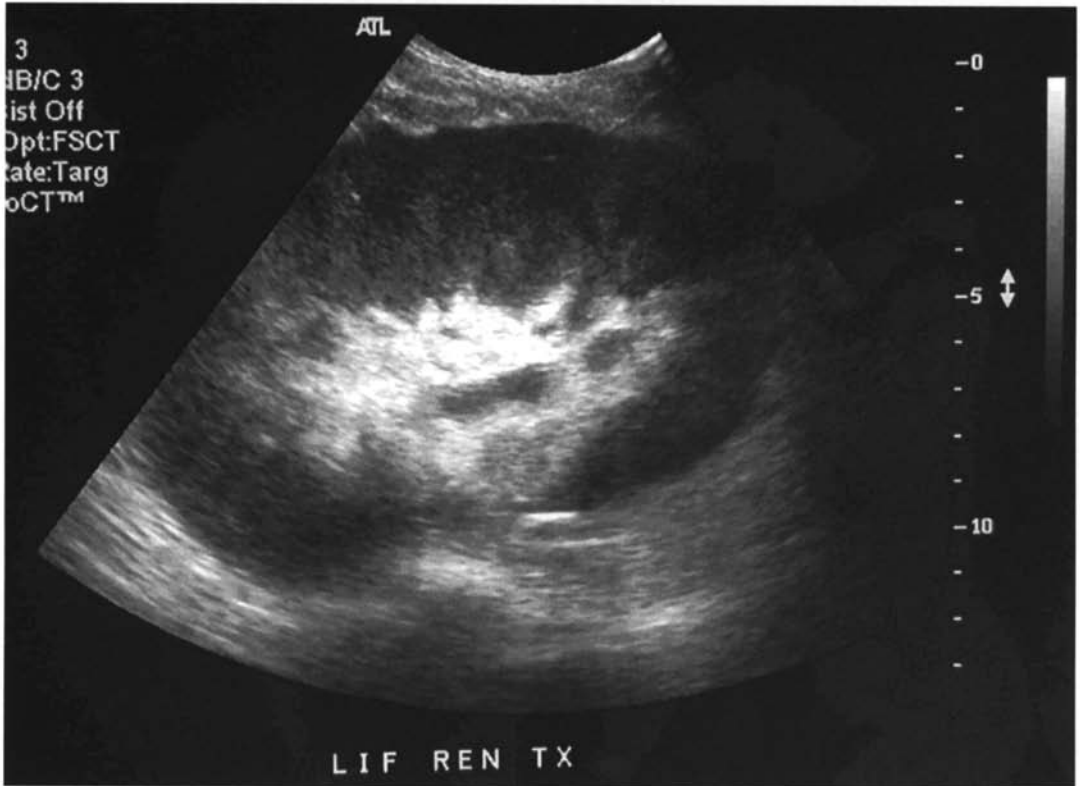
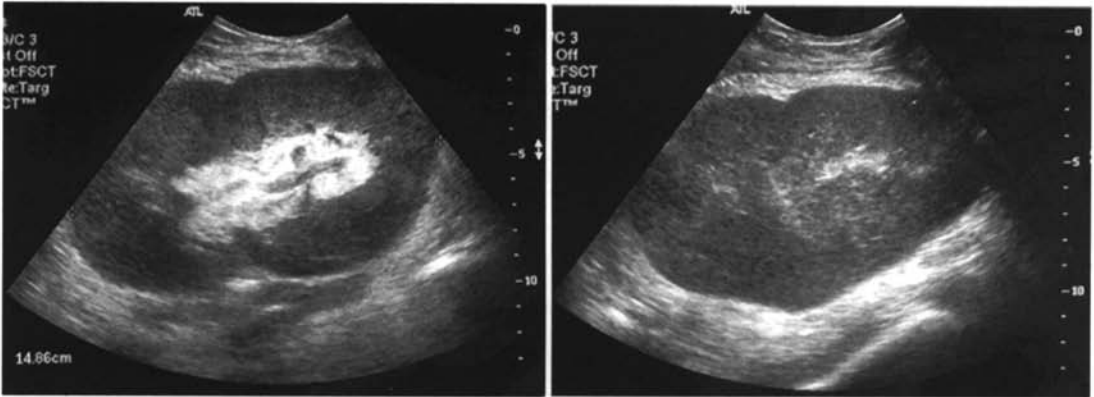
Hematoma—biopsy, trauma

Hemorrhage into mass—e.g., AML



ENLARGED KIDNEY WITH LOSS OF CORTICO-MEDULLARY ARCHITECTURE

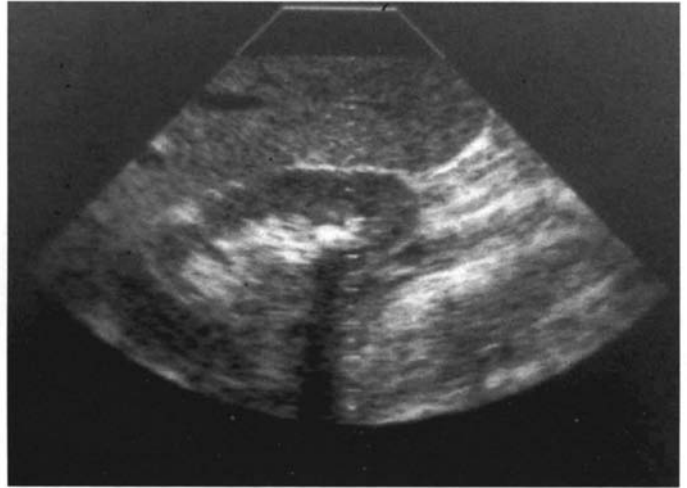
- Infection
- Renal vein thrombosis
- Rejection, ATN, or cyclosporin toxicity in renal Tx
- Lymphoma



SHADOWING FOCI ADJACENT TO RENAL HILUM

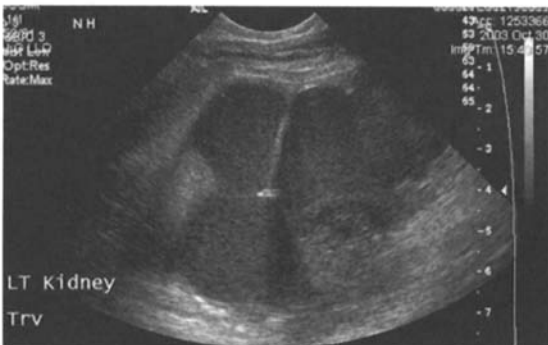
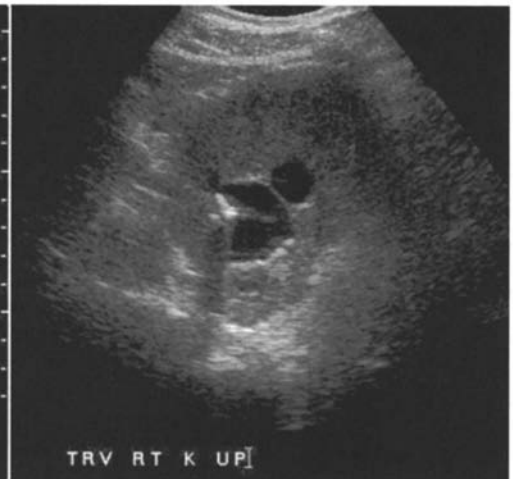
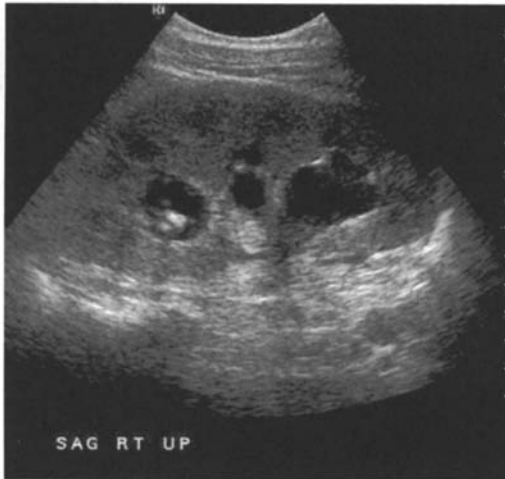
Stone

Renal artery calcification



ECHOGENIC MATERIAL IN COLLECTING SYSTEM

- Stone
- Clot
- TCC
- Pus
- Fungus ball



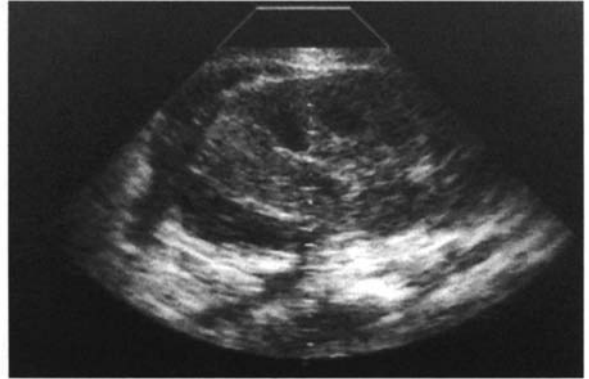
FLUID COLLECTION AROUND TRANSPLANTED KIDNEY

Hematoma

Lymphocele

Urinoma—usually originate from ureteric implantation site into bladder

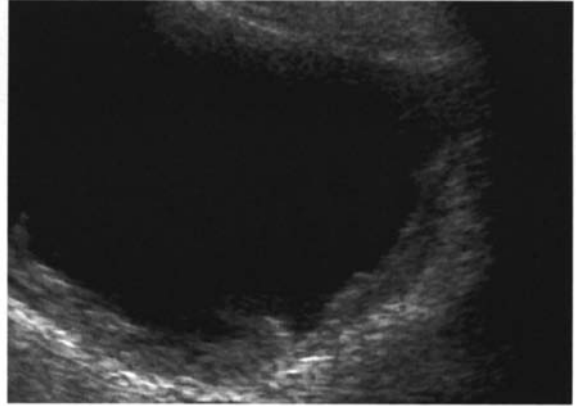
Abscess



BLADDER

THICKENED BLADDER WALL

- Bladder outlet obstruction
- Posterior urethral valves
- Prostatic hypertrophy
- Neurogenic bladder



TESTIS + PROSTATE

INTRATESTICULAR MASS

Tumor—Palpable

Primary malignant—seminoma, germ cell tumor

Primary benign—Leydig and Sertoli cell

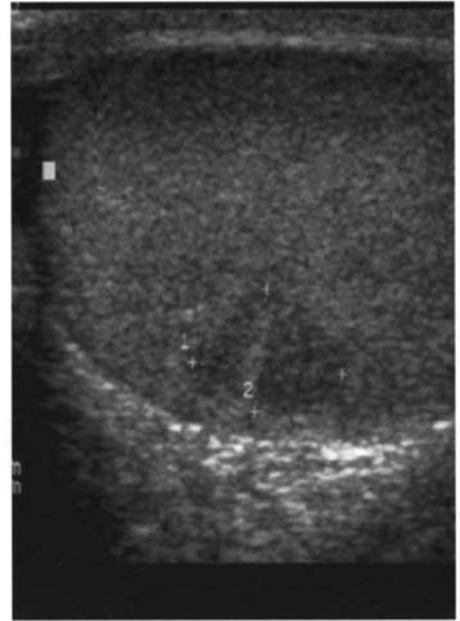
Metastasis—lymphoma

Infection—Nonpalpable

Focal orchitis

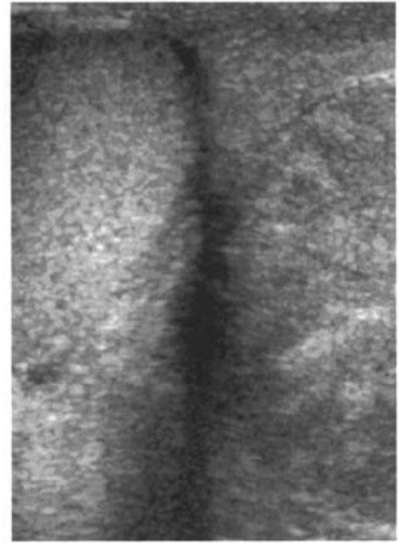
Abscess

Hematoma



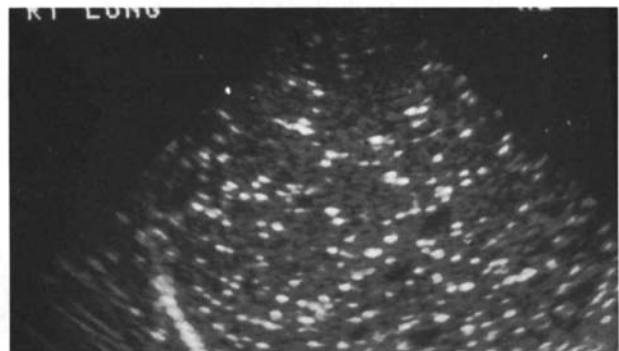
DIFFUSELY ENLARGED HYPOECHOIC TESTIS

- Torsion—decreased flow
- Orchitis
- Tumor—lymphoma, seminoma



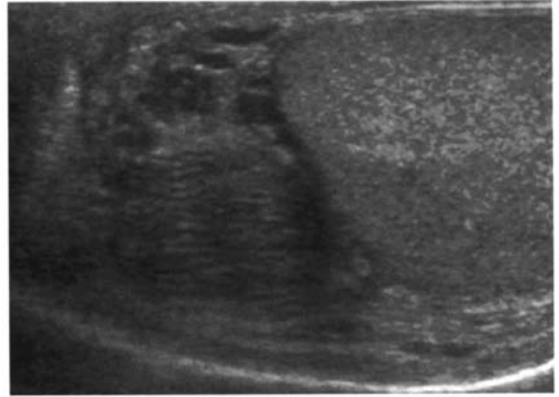
HYPERECHOIC FOCI

- Testicular microlithiasis
- Microcalcifications in undescended testis
- Klinefelter's Syndrome
- Sarcoid



EPIDIDYMAL MASS

Focal epididymitis
Sperm cell granuloma—post-vasectomy
Benign adenomatoid tumor



HYPOECHOIC PROSTATIC NODULE

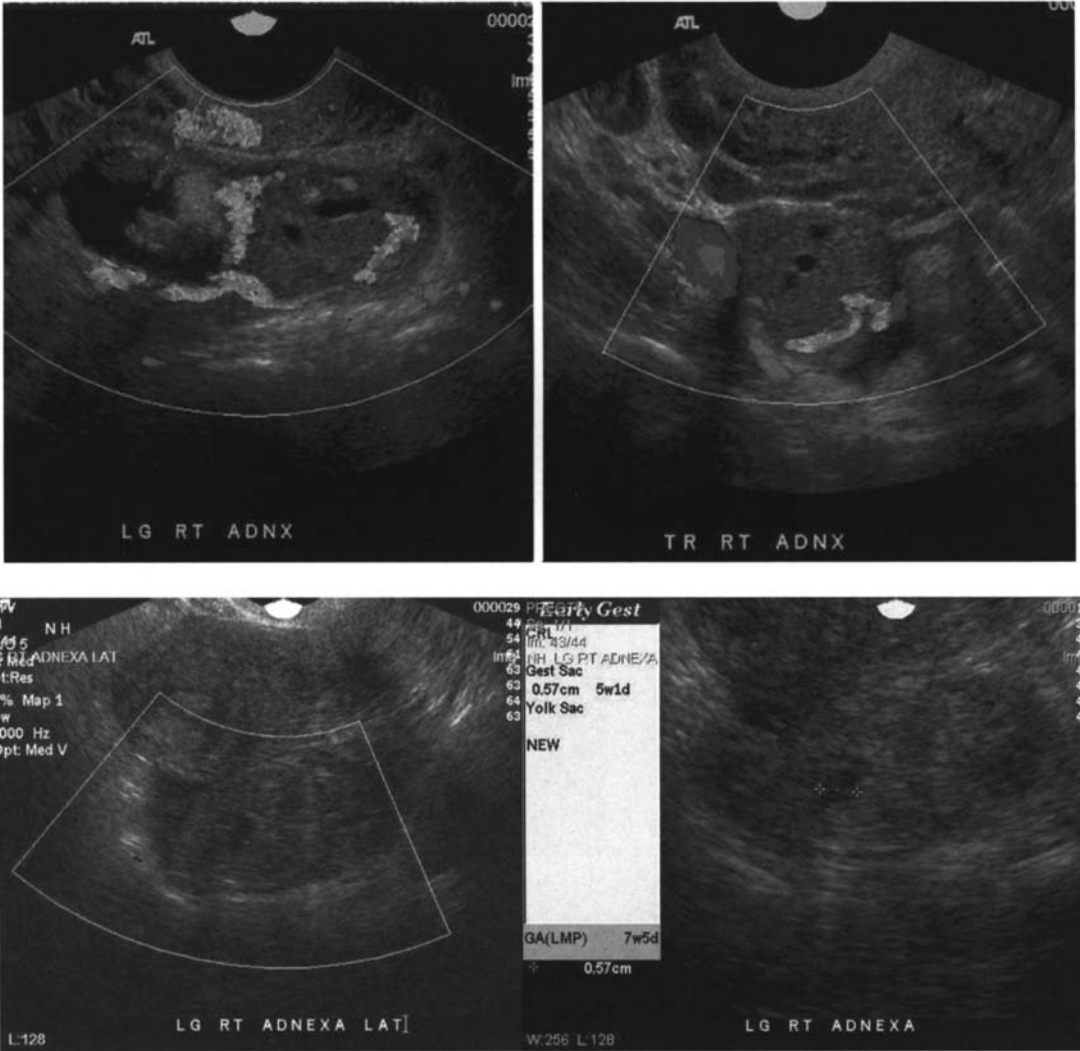
Malignant-Ca
Benign—prostatitis, BPH, infarct



Obstetrical Ultrasound

UTERUS

EXTRAUTERINE MASS WITH + β HCG = ectopic



COMPLEX INTRAUTERINE MASS WITH + β HCG

Molar pregnancy

Failed pregnancy with retained products of conception

Decidual reaction of ectopic



GESTATION

EMPTY GESTATIONAL SAC IN FIRST TRIMESTER

Normal IUP <5 wk

Ectopic with pseudogestational sac

Failed pregnancy—blighted ovum; missed abortion

1000 u/5.0 wk—GS

>1000 u/5.5 wk—GS + YS

10,000+ u/6.0 wk—GS + YS + EMBRYO



OLIGOHYDRAMNIOS

GU anomalies—e.g., renal agenesis; obstruction

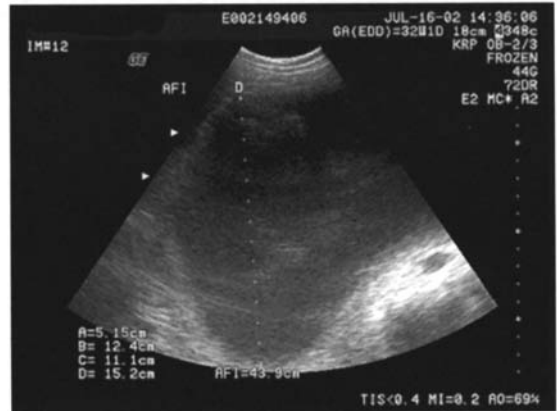
Spontaneous rupture of membranes—third trimester

Fetal demise >5 d



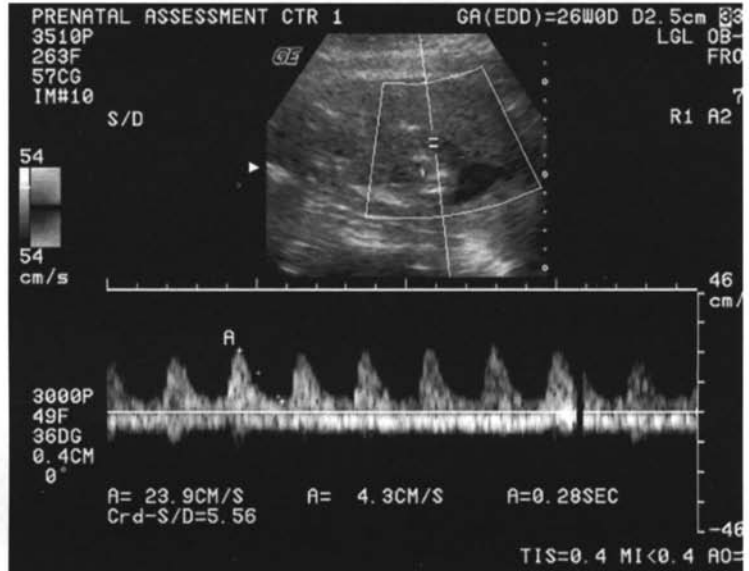
POLYHYDRAMNIOS

- Idiopathic
- Maternal diabetes
- CNS or GI anomalies that inhibit swallowing
- Hydrops



IUGR

- Placental insufficiency—hypertension, diabetes
- Smoking, drug abuse
- Chromosomal anomalies



PRENATAL ASSESSMENT CTR 1 LMP: / / AGE: 33YR
G 0 P 0 A 0 E 0 05/21/01

REF MD:
HISTORY:

	MEASUREMENT			AVG	AGE weeks	RANGE weeks	CUR %	Y/N	SOURCE
	1	2	3						
GS									HELLMAN
CRL									HADLOCK
BPD	5.1			5.1	21W4D	19W6D-23W1D	< 3%	Y	HADLOCK
HC	19.8			19.8	22W0D	20W4D-23W4D	< 3%	Y	HADLOCK
AC	16.3			16.3	21W3D	19W2D-23W4D	< 3%	Y	HADLOCK
FL	3.5			3.5	21W0D	19W1D-22W6D	< 3%	Y	HADLOCK
TCD									HILL
HL									JEANTY
TCD									HILL
TIB									JEANTY
ULNA									JEANTY
FT									MERCER
THD									HANSMANN
BD									JEANTY
AFI	3.3				Range(cm)	8.8 - 23.4			MOORE
	1	2	3	AVG			1	2	3
RI						Heart Rt	126		126
PI						Crd-S/D	5.56		5.56
						Ut-S/D			

GA(EDD): 26W0D EDD(EDD): 08/27/01
 Ultrasound Age: 21W3D +/-1W4D Ultrasound EDD: 09/28/01
 BASED ON: BPD HC AC FL

EFW: 414 grams (0Lbs 15oz) range 383- 445 grams
 BASED ON: (BPD AC HC FL - HADLOCK) EFW%: < 3%
 Heart Rate: 126bpm

RATIOS		FLOW DATA	
CI	77 (70-86)	Ut-S/D	
FL/BPD	69 (-)	Crd-S/D	5.56
FL/HC	17.7 (15.9-20.3)	RI	
FL/AC	21 (20-24)	PI	
HC/AC	1.21 (1.06-1.25)		

HYDROPS

- Immune (rare now with RhoGam)
- Cardiovascular—arrhythmia, anatomic anomalies
- Chromosomal anomalies—karyotype
- TORCH infections—titers
- Anemias—umbilical cord sampling
- High output failure—sacroccygeal teratoma; chorioangioma
- Twin-to-twin transfusion syndrome



CNS + FACE

FLUID-FILLED SKULL

- Hydrocephalus (mantle of cortex)
- Hydranencephaly (irregular hyperechoic areas of tissue)



THICKENED NUCHAL FOLD

First 11-14 wk 3 MM (IN-IN)

Second 15-20 wk 6 MM (OUT-OUT)

Trisomy 21

Turners



CYSTIC STRUCTURE ADJACENT TO SKULL

Cystic hygroma

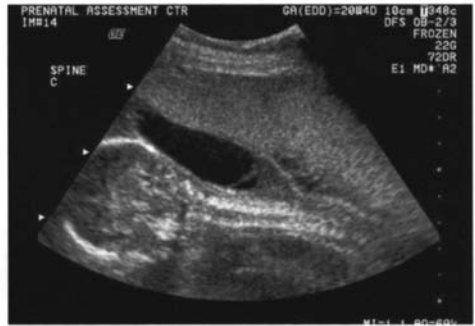
Encephalocele or myelomeningocele—calvarial defect; signs of open neural tube defect

Teratoma



CYSTIC HYGROMA

Chromosomes—Turner's, Trisomy 21
Lymphangiectasia
Hydrops



AGENESIS OF THE CORPUS CALLOSUM/SEPTUM PELLUCIDUM

- Intrahemispheric cyst
- Colpocephaly
- Absent cavum



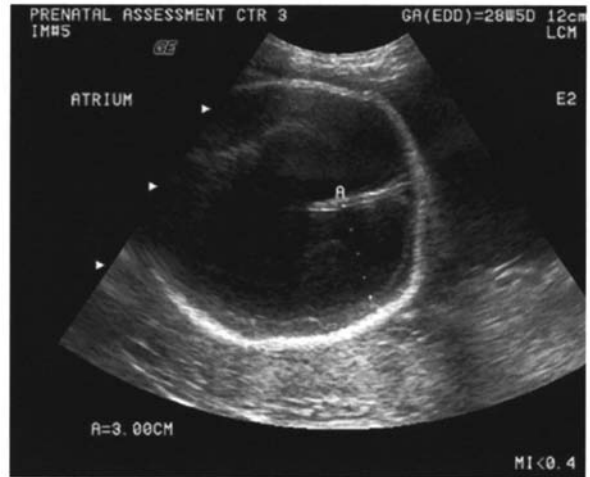
Dandy Walker
Chiari
Trisomy 13, 18



VENTRICULOMEGALY

TORCH

- Chromosomal—Trisomy 21
- Intracranial bleed
- Dandy-Walker, Chiari
- Aqueductal stenosis



CYSTIC STRUCTURE IN POSTERIOR FOSSA

- Normal before 8 wk
- Dandy-Walker malformation or variant
- Mega cisterna magna
- Arachnoid cyst



INTRACRANIAL CYSTIC STRUCTURE

- Arachnoid cyst
- Porencephalic cyst



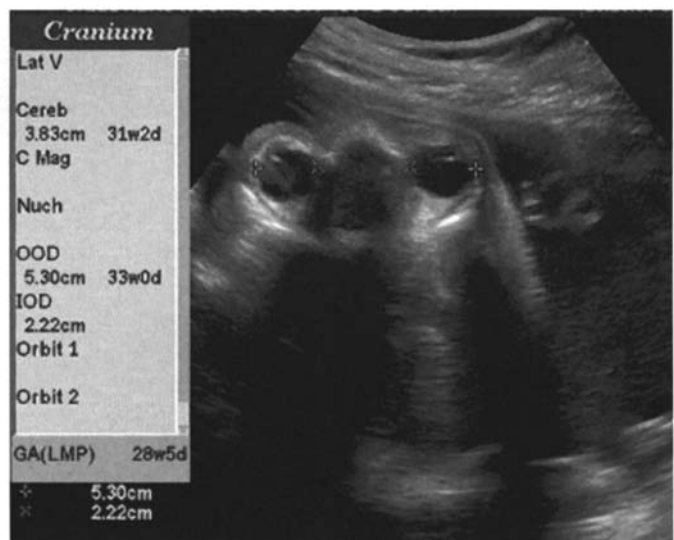
HYPOTELORISM

Holoprosencephaly
Trisomy 13
Maternal phenylketonuria



HYPERTELORISM

Frontal encephalocele
Cleft lip sequence
Apert syndrome



CLEFT LIP AND PALATE

Chromosomal—trisomy 13

Teratogen—fetal alcohol

Holoprosencephaly



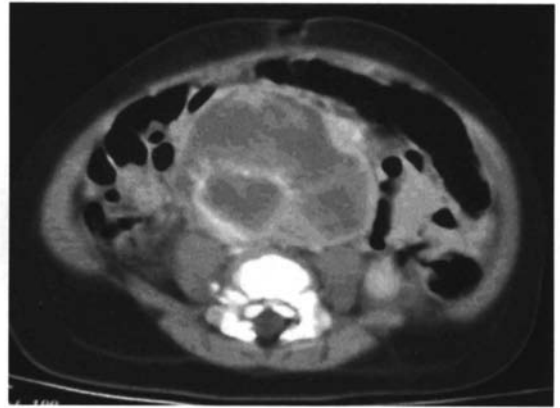
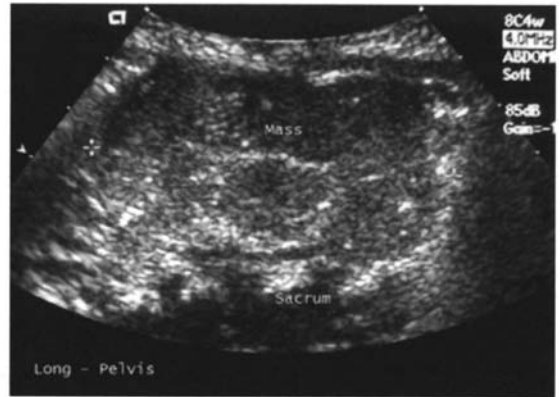
MASS POSTERIOR TO THE SACRAL SPINE

Sacrococcygeal teratoma
Myelomeningocele (spinal dysraphism
with banana and lemon signs)



PRESACRAL SOFT TISSUE MASS

- Sacrococcygeal teratoma
- Anterior myelomeningocele
- Chordoma



CHEST

CYSTIC MASS IN THE CHEST

- CCAM I or II
- Diaphragmatic hernia
- Bronchopulmonary foregut malformation,
e.g., bronchogenic cyst, esophageal duplication
- Teratoma

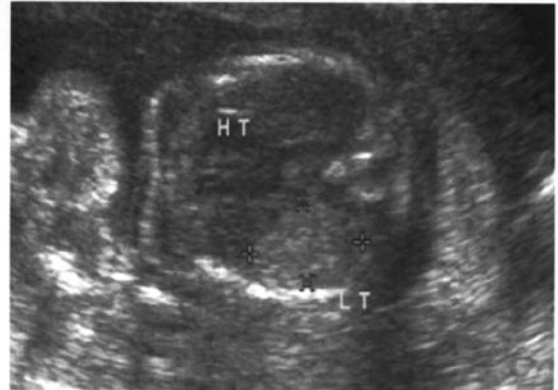


SOLID MASS IN THE CHEST

Pulmonary sequestration

CCAM III

Morgagni diaphragmatic hernia (liver herniation)



PLEURAL EFFUSION

- Hydrops—bilateral
- Chylous—unilateral



ABDOMEN

ANTERIOR ABDOMINAL WALL DEFECT

Normal prior to 12 wk

Omphalocele—covered by membrane; associated with structural and chromosomal anomalies

Gastroschisis—free-floating bowel; no associated anomalies

Bladder or cloacal extrophy = omphalocele, imperforate anus, myelomeningocele

Amniotic bands

Pentalogy of Cantrell—ectopia cordis; omphalocele

Limb-body wall complex—neural tube defect, limb anomalies, short straight umbilical cord

Beckwith-Wiedemann = omphalocele, macroglossia, visceromegaly



CALCIFICATIONS IN ABDOMEN

Meconium peritonitis

TORCH

Calcified teratoma

Echogenic bowel (no shadowing)



MECONIUM PERITONITIS—CALCIFICATIONS; CALCIFIED PSEUDOCYST

Normal

Distal obstruction

—atresia, volvulus, polyhydramnios

Cystic fibrosis—meconium ileus



ABSENT STOMACH BUBBLE

- Esophageal
- Diaphragmatic hernia
- CNS anomaly causing absence of swallowing
- Oligohydramnios



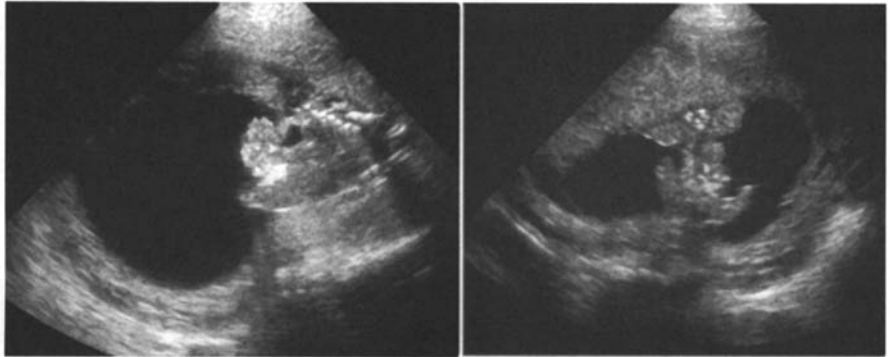
DOUBLE BUBBLE

- Duodenal atresia—Trisomy 21
- Annular pancreas
- Malrotation with midgut volvulus
- Choledochal cyst



CYSTIC STRUCTURE IN ABDOMEN AND PELVIS WITH NORMAL STOMACH BUBBLE

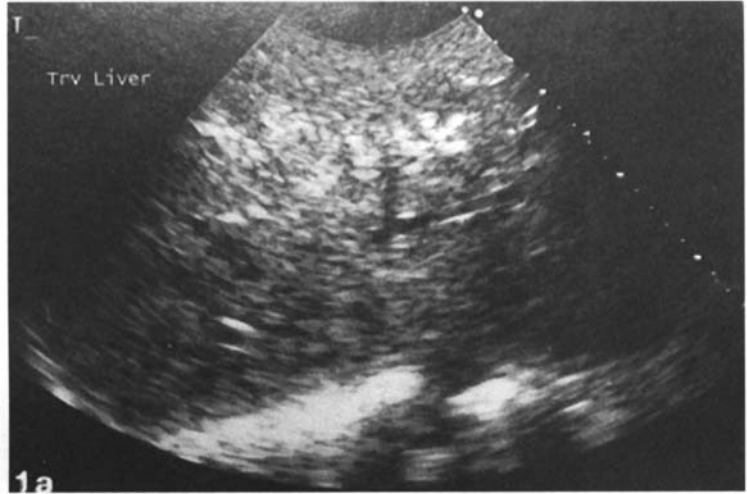
- Renal cysts, hydronephrosis, urinoma
- Bladder
- Bowel duplication
- Ovarian cyst
- Mesenteric cyst
- Urachal cyst
- Teratoma



LIVER

CALCIFICATIONS IN LIVER

Incidental
TORCH—esp. CMV or Toxoplasmosis



BOWEL

ECHOGENIC BOWEL: FOLLOW-UP IMAGING RECOMMENDED

- Cystic fibrosis
- Chromosomal—Trisomy 21
- CMV
- Intracut bleed



FETAL ASCITES

FLUIDS:

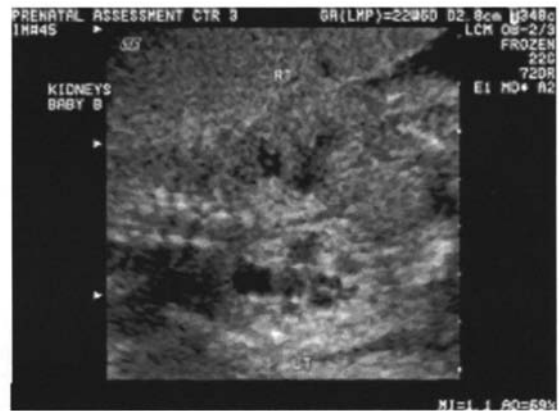
- Blood—hemoperitoneum
- Urine—collecting system
- Bowel—meconium peritonitis
- General—hydrops
- Serous fluid—ruptured ovarian cyst



KIDNEYS

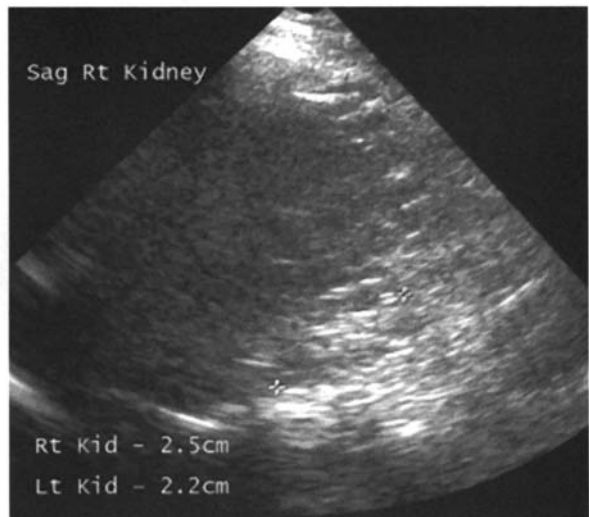
RENAL CYSTIC STRUCTURES

Multicystic dysplastic kidney
Severe hydronephrosis



ECHOGENIC KIDNEYS

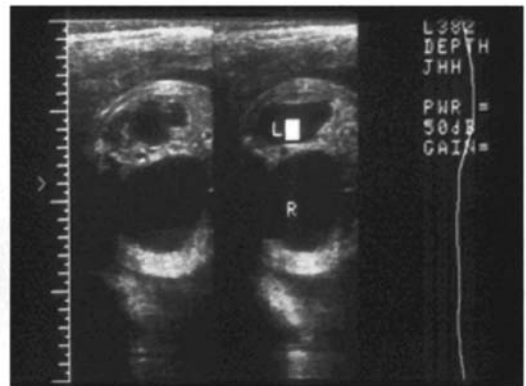
Small—obstructive renal dysplasia



Large—APCKD, Meckel-Gruber



Bilateral hydronephrosis
 Posterior urethral valves
 Reflux
 Bilateral UPJ or UVJ

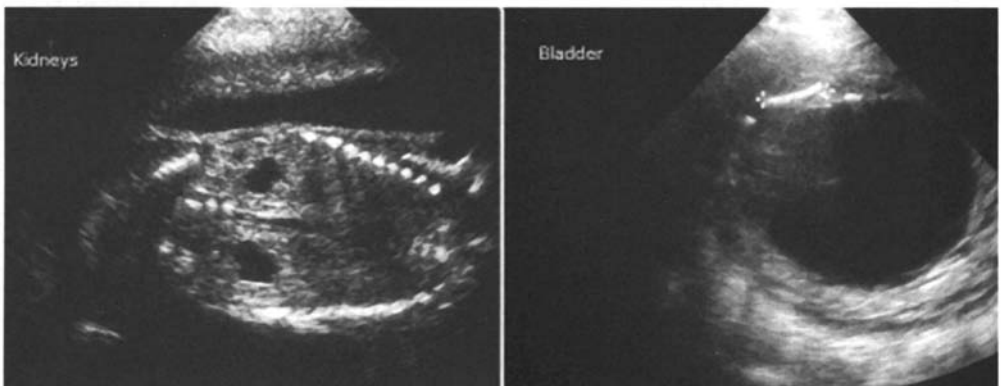


DILATED COLLECTING SYSTEMS AND BLADDER

Obstruction, e.g., posterior urethral valves

Prune belly

Megacystitis microcolon hypoperistalsis intestinalis—polyhydramnios and intestinal obstruction



LIMBS

ABSENT RADIAL RAY

VATER

Trisomy 18

Fanconi's anemia

Holt-Oram syndrome—cardiac anomalies

Amniotic bands



POLYDACTYLY

Familial

Trisomy 13

Meckel Gruber—encephalocele, polycystic kidneys



SHORT LIMBS

Trisomy 21

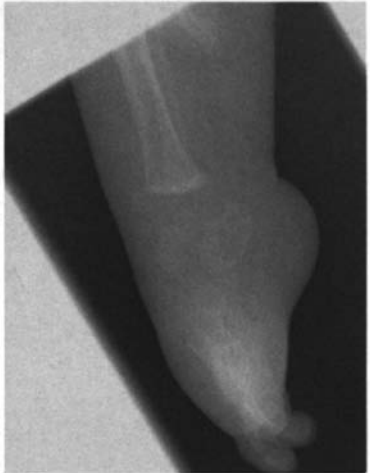
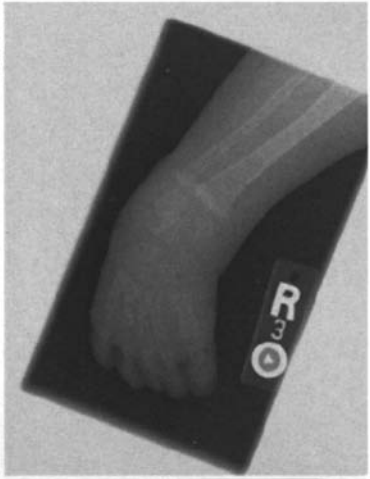
Dwarfs—thanataphoric dwarf, achondrogenesis

Amniotic bands—asymmetric shortening



CLUBFOOT

- Idiopathic
- Oligohydramnios
- Trisomy 18
- Amniotic bands



PLACENTA + CORD

TWO-VESSEL CORD

- Renal anomalies
- Cardiac anomalies
- Trisomies 13 & 18



PLACENTA AT MARGIN OF INTERNAL CERVICAL OS

- Marginal previa
- Full bladder
- Normal until 36 wk



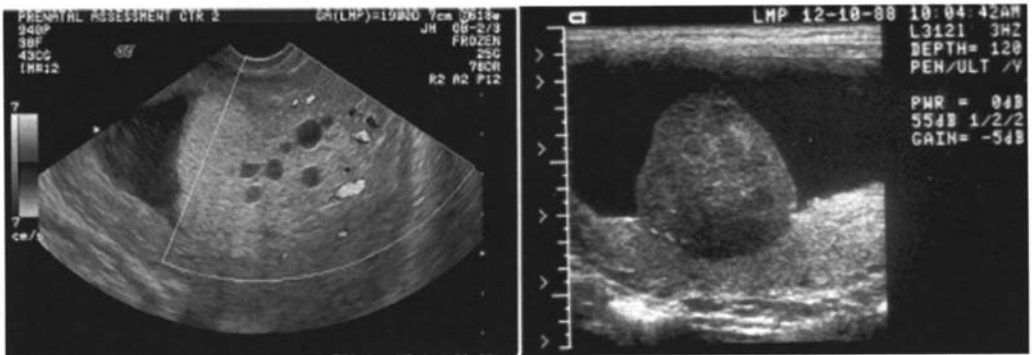
RETROPLACENTAL COLLECTION

Placental abruption
 Vascular complex
 Uterine contraction
 Fibroid



PLACENTAL MASS

Chorangioma
 Uterine contraction—NO FLOW
 Fibroid—NO FLOW
 Mole
 Hydrops
 Infection
 Abruption



HETEROGENEOUS MASS CONTIGUOUS WITH PLACENTA; FETUS PRESENT

- Partial mole
- Partial hydropic placenta
- Loculated placental abruption
- Chorioangioma



UTERUS + OVARIES + OTHER

MYOMETRIAL MASS DURING PREGNANCY

- Uterine contraction
- Fibroid
- Cornual ectopic pregnancy
- Extrauterine mass—adnexal, ovaries, bowel



MULTICYSTIC ENLARGED OVARY = THECA LUTEAL CYSTS

- Gestational trophoblastic disease
- Twins
- Rh incompatibility



TWO SACS IN FIRST TRIMESTER

- Twins (vanishing twin)
- Subchorionic hematoma
- Implantation bleed
- Necrotic fibroid



MEMBRANE ACROSS GESTATIONAL SAC DURING SECOND AND THIRD TRIMESTER

- Twins
- Amniotic sheet
- Circumvallate placenta



OLIGOHYDRAMNIOS

- DRIPS**
- Demise
- Renal
- IUGR
- PROM
- PoSdates



POLYHYDRAMNIOS

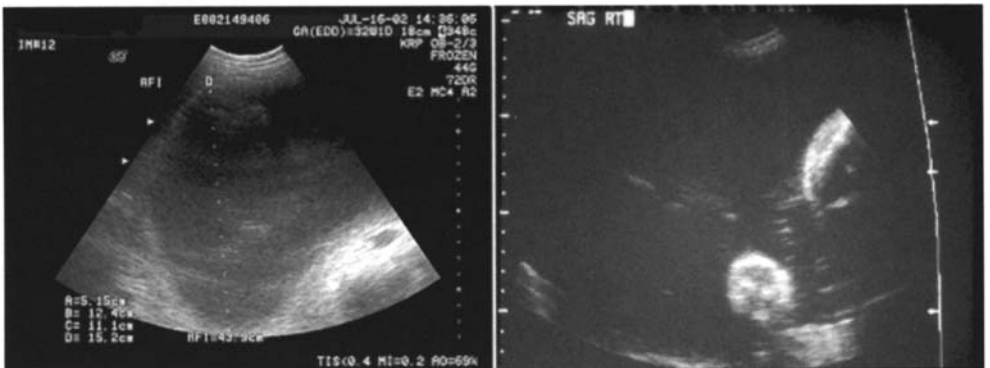
TARDI

Twins

Anomalies (fetal): esophageal atresia, duodenal/proximal small bowel obstruction, omphalocele, non-immune hydrops, anencephaly, hydranencephaly, holoprosencephaly, myelomeningocele, ventriculomegaly, agenesis of CC, encephalocele, microcephaly, diaphragmatic hernia, CCAM, tracheal atresia, extralobar sequestration, trisomy (13,18,21)

Rh incompatibility

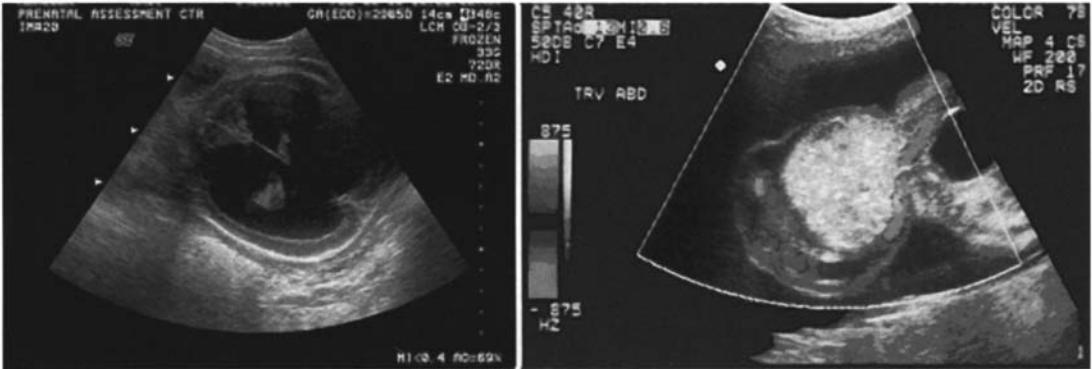
Idiopathic (60%)—associated with macrosomia



CHROMOSOMAL ABNORMALITY SYNDROMES

TRISOMY 13

- CNS—holoprosencephaly, facial clefts
- GI/GU—omphalocele, renal cystic dysplasia
- MSK—polydactyly



TRISOMY 18

CNS—microcephaly, choroid plexus cysts, micrognathia, brachycephaly

GI/GU—omphalocele, diaphragmatic hernia

MSK—club foot, absent radial ray, clenched hands

Other—early symmetric IUGR, cord cyst



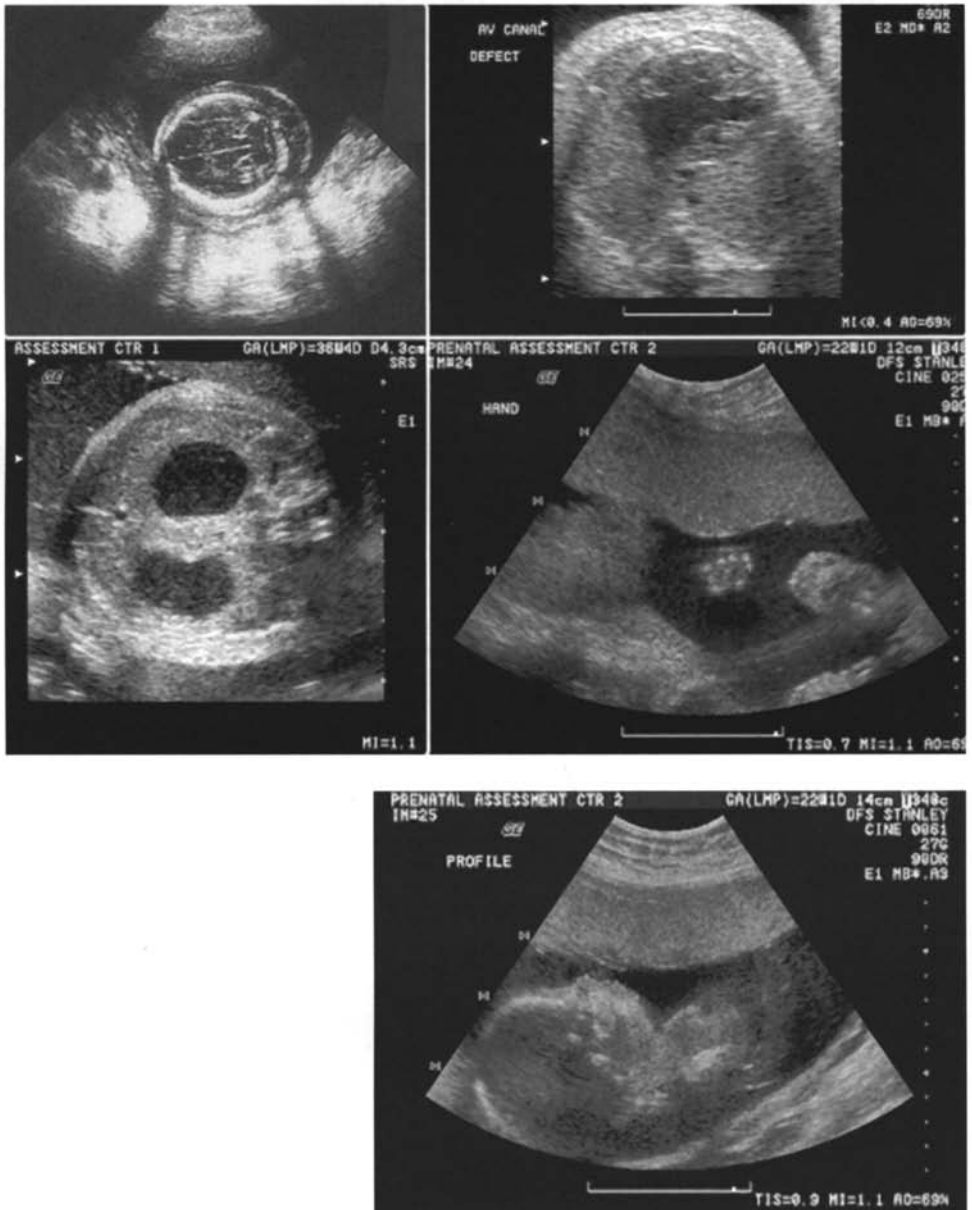
TRISOMY 21

CNS—nuchal fold thickening, cystic hygroma

Cardiac—endocardial cushion defect, echogenic intracardiac focus

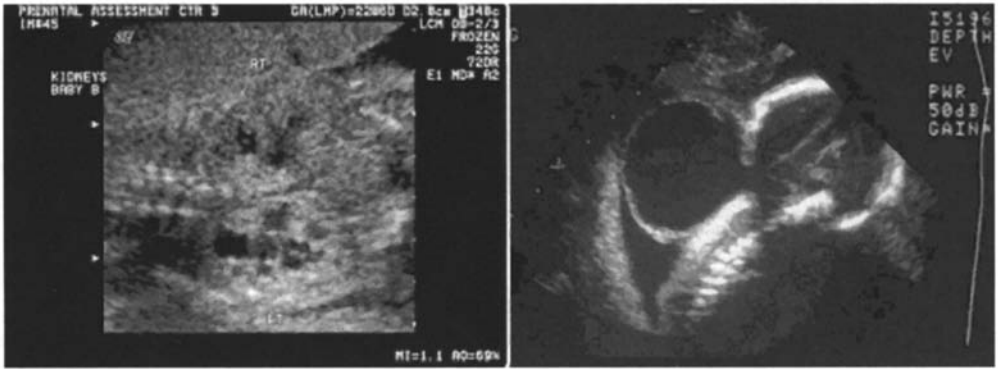
GI/GU—duodenal atresia, echogenic bowel, renal pelviectasis

MSK—short femur and humerus, widened iliac angle, clinodactyly fifth finger



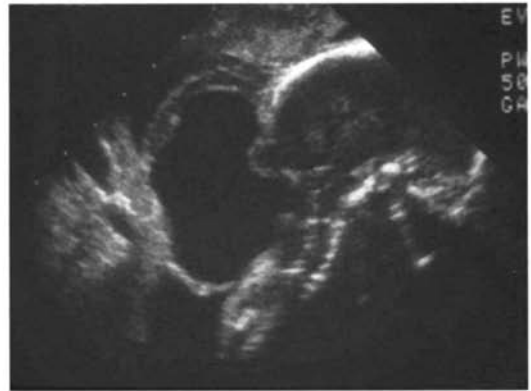
MECKEL GRUBER

- Cystic kidneys = ARPCKD
- Encephalocele
- Polydactyly



TURNER'S

- Cystic hygroma
- Nuchal fold thickening
- Coarctation of aorta



TRIPLOIDY

Asymmetric IUGR (large head, small body)

Molar placenta



GYNECOLOGICAL ULTRASOUND

Uterus

INTRAUTERINE COLLECTION

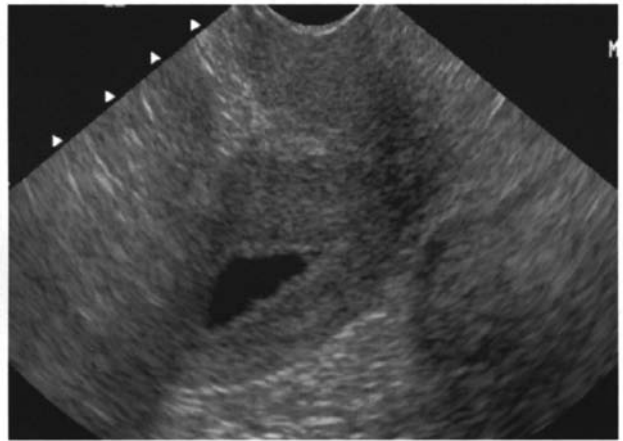
Retained products of conception—premenopausal

Pseudogestational sac—+ β HCG

Cervical stenosis—postmenopausal

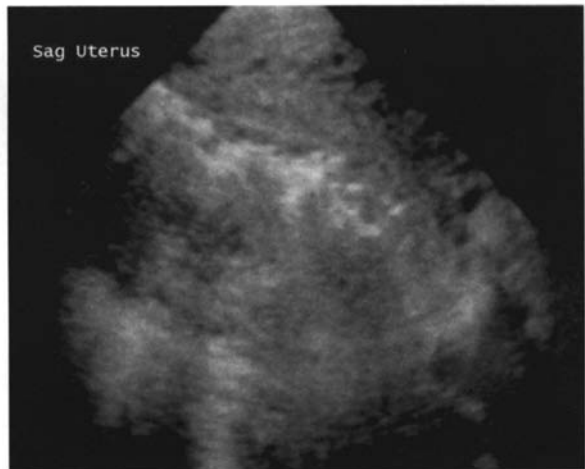
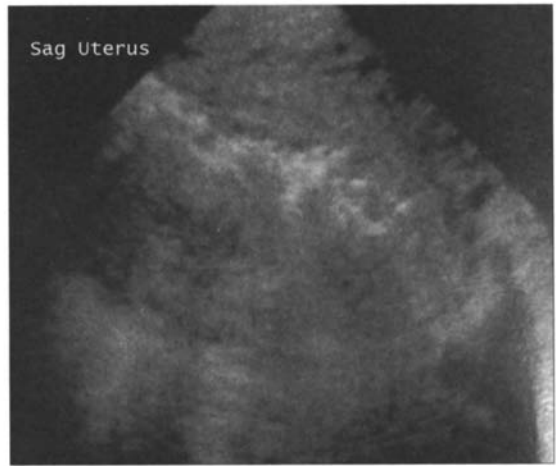
Cervical carcinoma—postmenopausal

Endometrial carcinoma—postmenopausal



GAS IN THE ENDOMETRIAL CAVITY

Endometritis with pyometria
Normal up to 4 wk postpartum



MULTIPLE SMALL HYPOECHOIC MASSES IN THE MYOMETRIUM

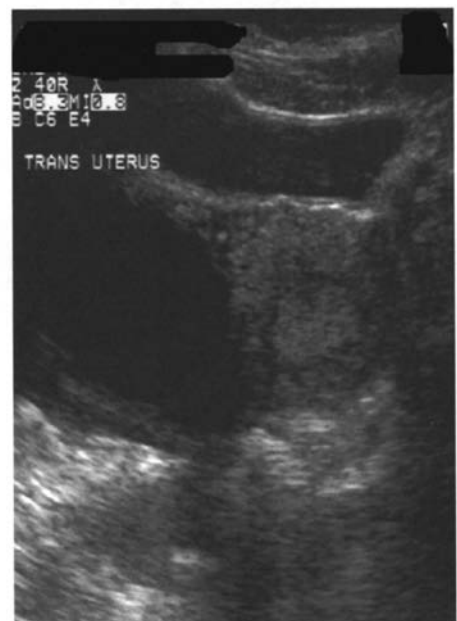
- Adenomyosis
- Multiple fibroids





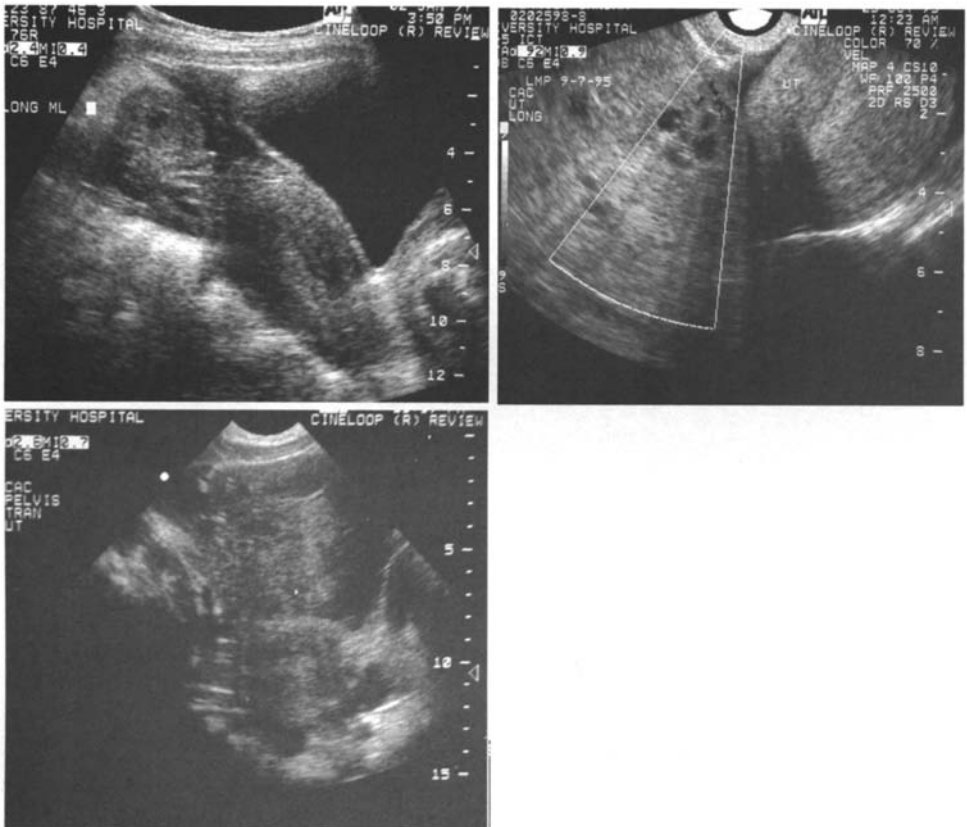
EXTRAUTERINE COMPLEX CYSTIC MASS—DDX DEPENDS ON HISTORY, AGE, ASYMPTOMATIC, PAIN, FEVER, TRAUMA

- Hemorrhagic cyst—resolve when rescan in 6 wk
- Endometrioma
- Teratoma
- Ovarian carcinoma—more likely in postmenopausal
- Ovarian torsion—pain
- Tubo-ovarian abscess
- Bowel abscess—appendicitis, diverticulitis
- Hematoma—posttraumatic



EXTRAUTERINE SOLID MASS

- Pedunculated fibroid
- Endometrioma and hemorrhagic cyst
- Teratoma
- Ovarian torsion—pain
- Fibrothecoma—ovarian
- Dysgerminoma—ovarian
- Ovarian metastasis, e.g., Krukenberg's tumor



OVARY

OVARIAN MASS

CHEETAH

- Cyst
- Hemorrhagic
- Endometrioma
- Epidermoid/Dermoid
- Torsion
- Abscess



VERY LARGE CYSTIC MASS WITH THIN SEPATATIONS

Ovarian neoplasm either benign (young) or malignant (old)

Loculated ascites—previous surgery or hemoperitoneum

Lymphangioma—previous surgery



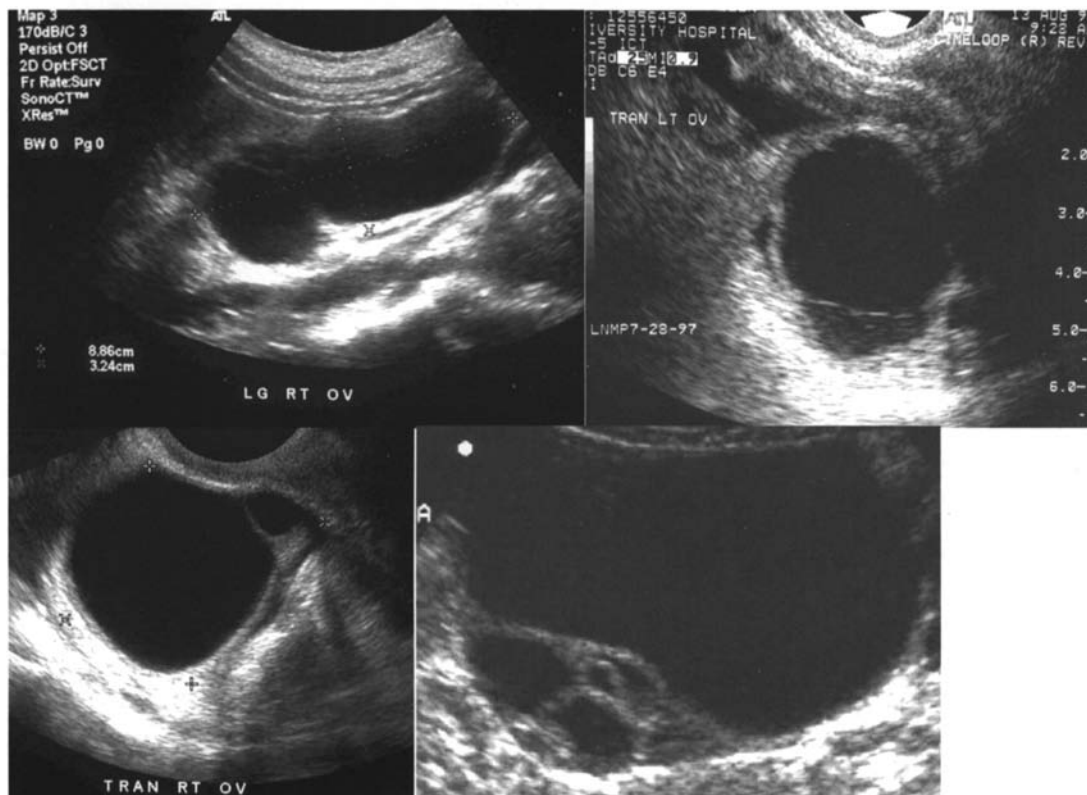
MULTICYSTIC ENLARGED OVARY

Ovarian neoplasms—cystadenoma or cystadenocarcinoma

Ovarian torsion (pain)

Theca lutean cyst—+ β HCG (bilateral)

Ovarian hyperstimulation—on Clomid (bilateral)



CALCIFIED PELVIC MASS

Fibroid

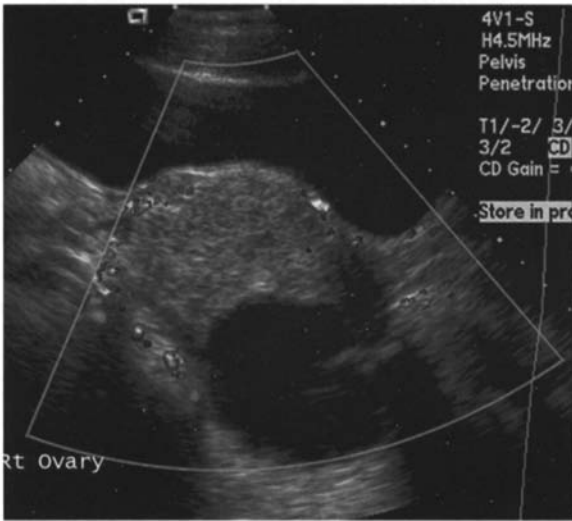
Dermoid

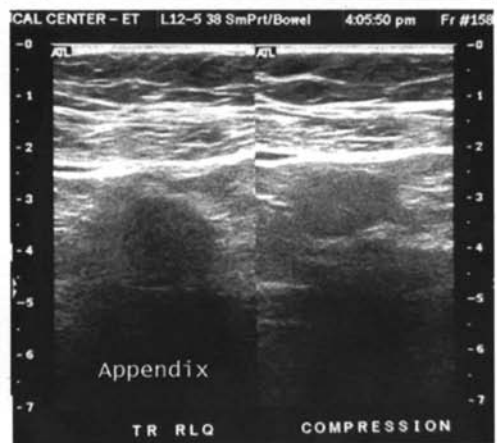
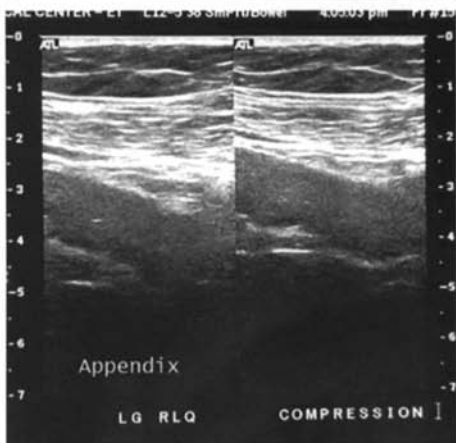
Ovarian neoplasm



ACUTE LOWER ABDOMEN

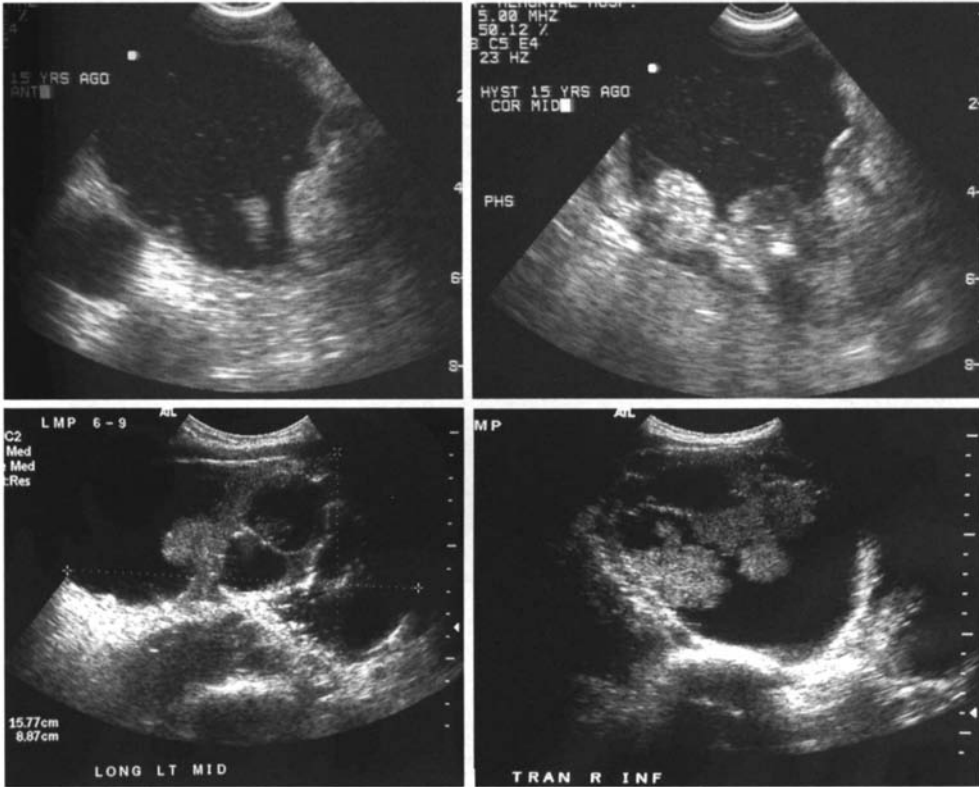
- Torsion
- Hemorrhage into ovarian cyst or endometrioma
- Abscess—tuboovarian or bowel
- Red degeneration of fibroid (during pregnancy)
- Appendicitis





ASCITES WITH INTRAPERITONEAL IMPLANTS

- Ovarian carcinoma
- Colon, pancreatic or stomach carcinoma
- TB



PEDIATRIC ULTRASOUND

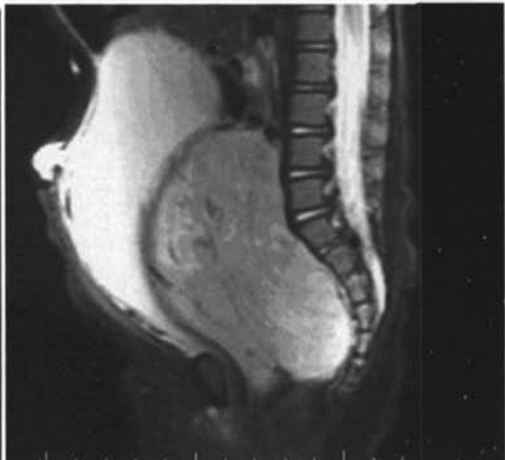
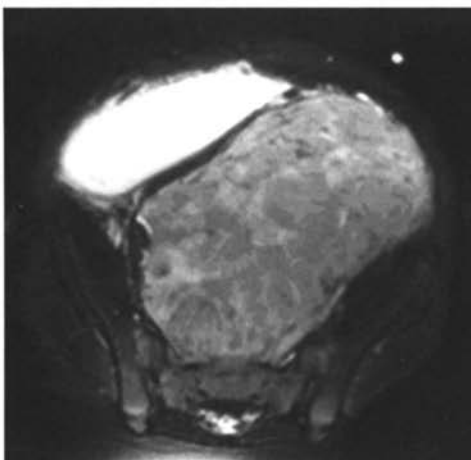
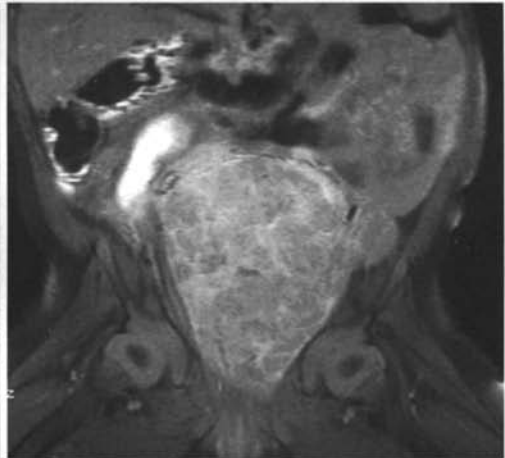
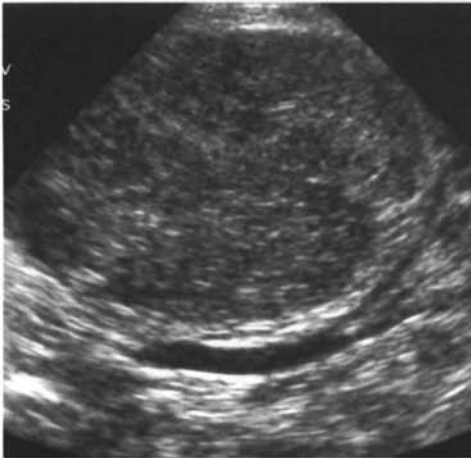
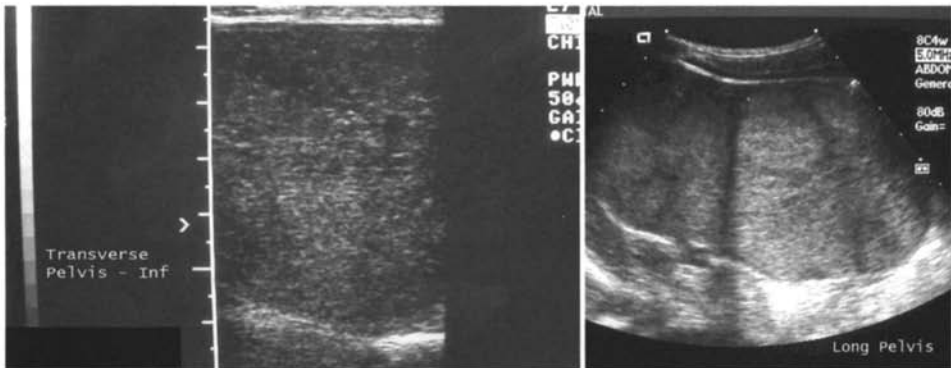
CHILD WITH SOLID PELVIC MASS

Lymphoma

Malignant germ cell tumor—dysgerminoma

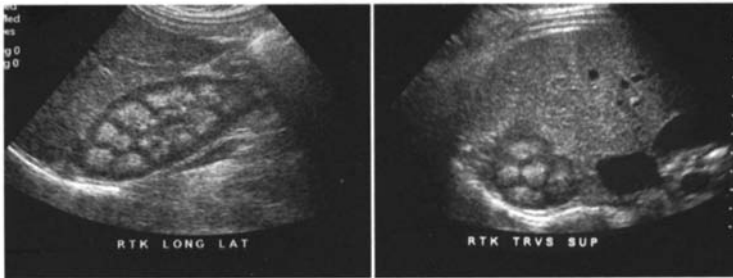
Sarcoma—bladder or vagina

Neuroblastoma



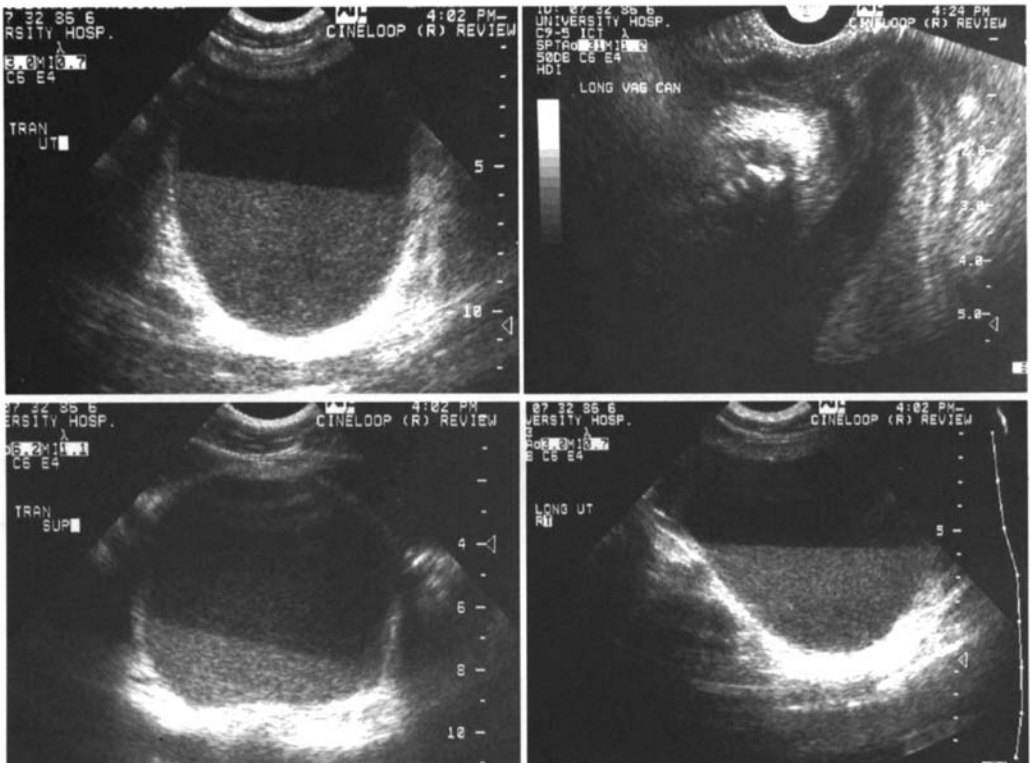
MEDULLARY NEPHROCALCINOSIS

- Lasix
- Renal tubular acidosis
- Tamm Horsfall proteins—rapidly resolve



PELVIC FLUID COLLECTION IN PREMENSES GIRL

- Hematometra—cevical dysgenesis, vaginal agenesis
- Hematocolpos—imperforate hymen, transverse vaginal septum



DOPPLER ULTRASOUND

DISCUSSIONS SHOULD INCLUDE:

1. Pulse (velocity)
2. Color (direction)
3. Power (flow)

VARIABLES INCLUDE:

1. Doppler gain
2. Doppler scale
3. Wall filters
4. Color gain
5. Color scale
6. Color priority

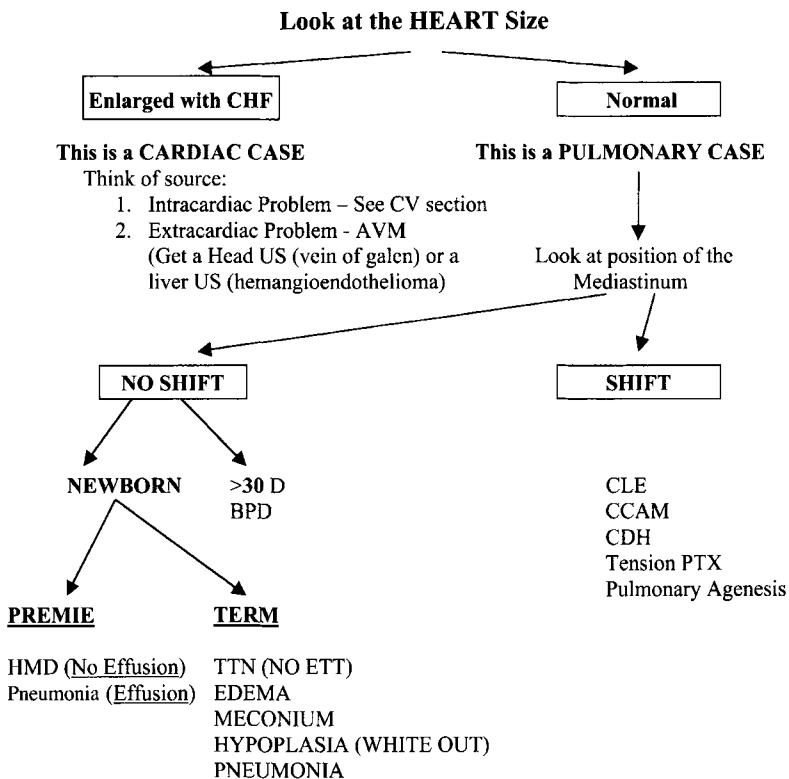
9

Pediatrics

Includes imaging procedures for the diagnosis of diseases in infants and children, such as plain film radiography, contrast medium studies, ultrasound, nuclear radiology, computed tomography, digital radiography, angiography, interventional techniques, magnetic resonance imaging, and congenital heart disease.

Chest

APPROACH TO THE PEDIATRIC CHEST XRAY



From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

EDEMA

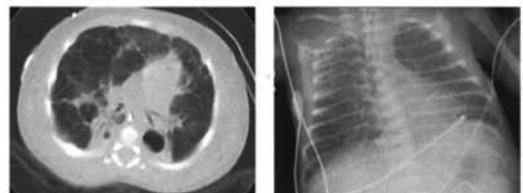


EITHER:

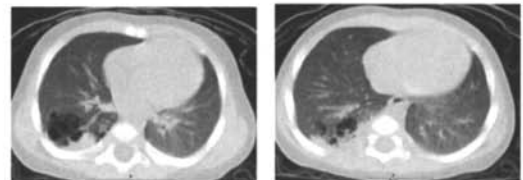
1. CLE



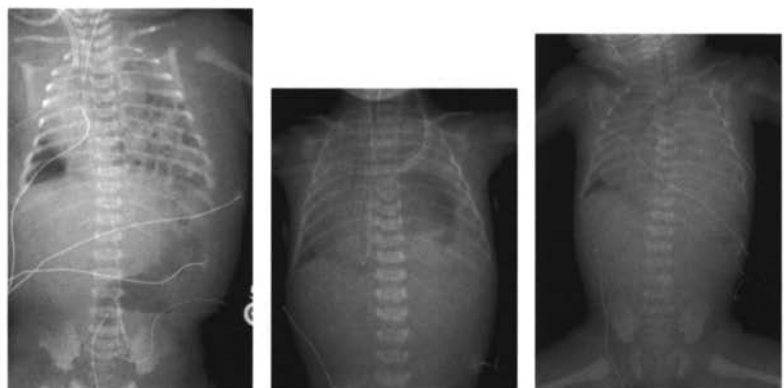
2. BPD



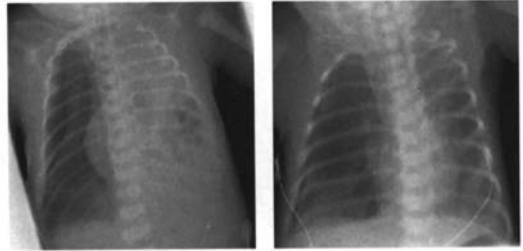
3. CAM



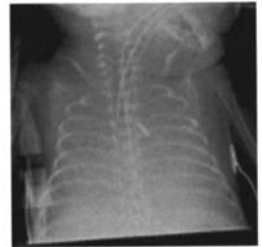
4. CDH



TENSION PTX



PULMONARY AGENESIS/HYPOPLASIA WHITE OUT



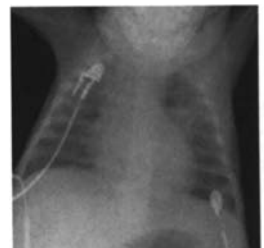
HMD (LLV NO EFF)



TTN (NO ETT)

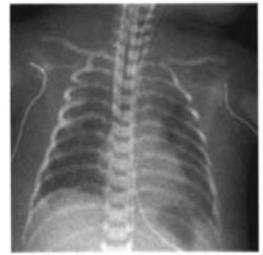


PNEUMONIA (EFFUSION)



EDEMA (OBST)

MECONIUM



BELL-SHAPED THORAX

Lung Hypoplasia

Abn Muscle/Bone—Dysplasia, Syndrome (JEUNE)

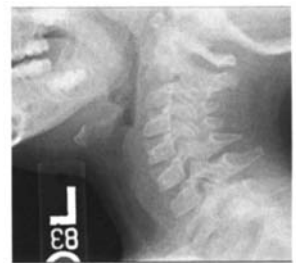
Nervous System—Tri 21, Paralysis



UPPER AIRWAY

Hemangioma

Tracheitis (membranous croup)





Retropharyngeal abscess



Epiglottitis



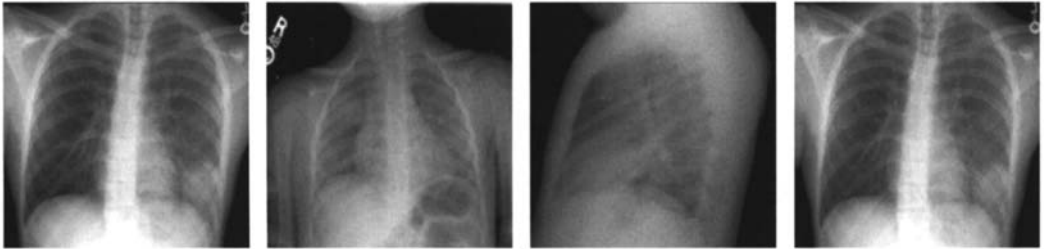
Croup



PULMONARY MASS

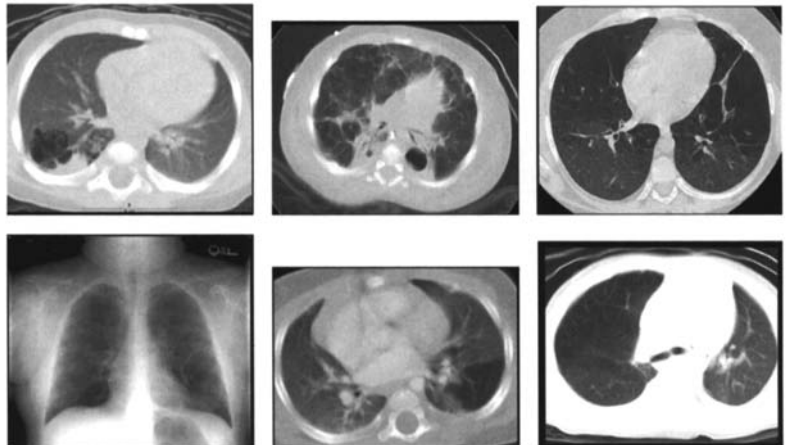
RAP'N FOREGUT

- Round pneumonia
- Abscess
- Pseudotumor
- Neoplasm (RARE) hamartoma, blastoma
- Foregut** malformations



BRONCHOPULMONARY FOREGUT MALFORMATIONS

- Congenital lobar emphysema
- CCAM
- Sequestration
- Bronchogenic cyst



CHEST WALL MASS

RENAL Mets

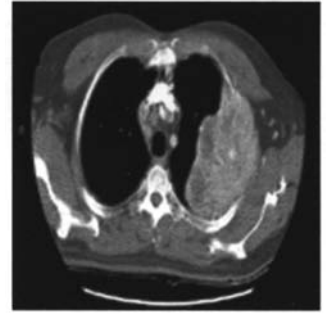
Rhabdomyosarcoma

Ewings

Neuroblastoma

Askin tumor/PNET

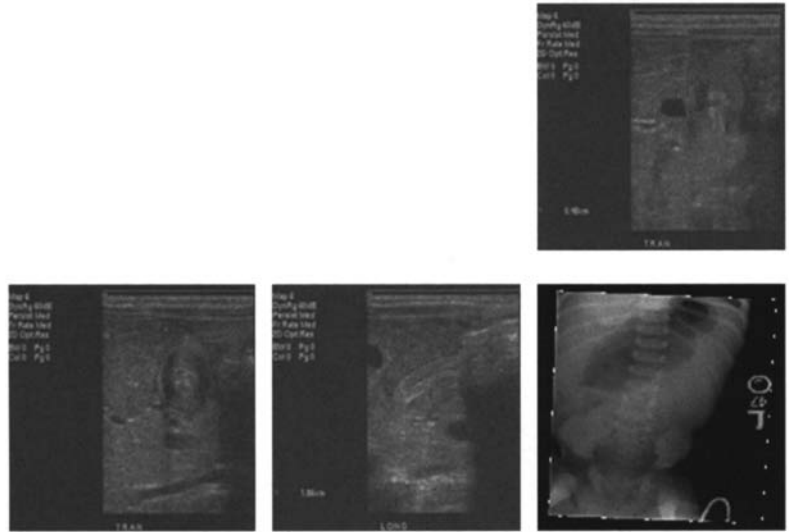
Lymphoma Mets



GI/GU

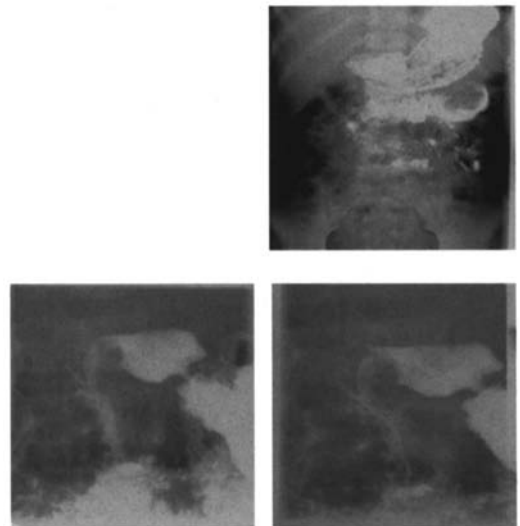
STOMACH

- HPS
- Spasm
- Antral web



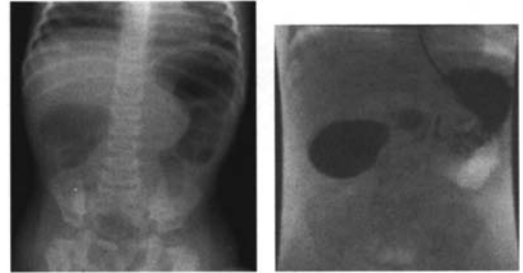
DUODENUM

- Annular pancreas
- Hematoma
- Preportal Duodenum
- Duodenal Stenosis



DOUBLE BUBBLE

- Duodenum
- Annular pancreas
- Volvulus
- Ladd's bands

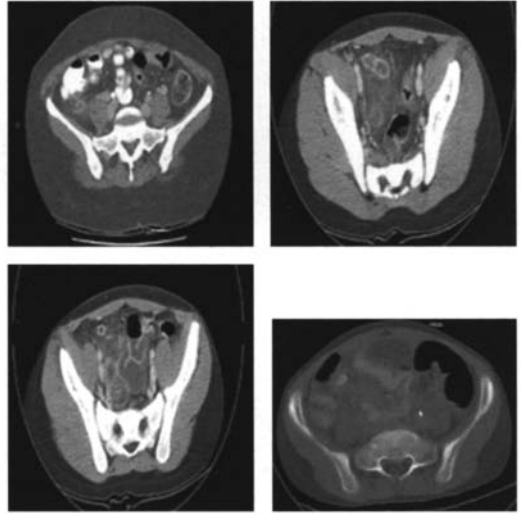


SMALL BOWEL OBSTRUCTION

- AA II MM
- Adhesion



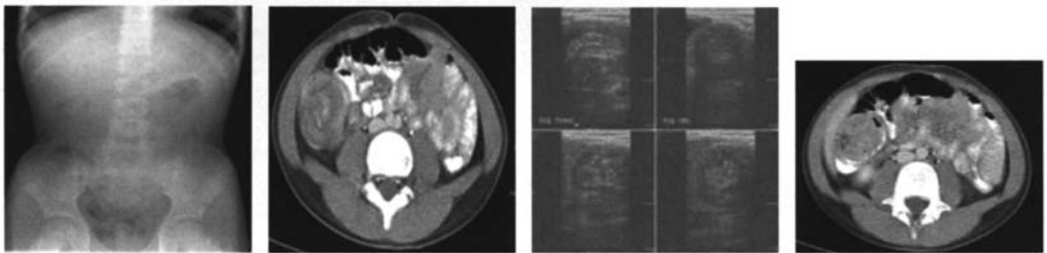
Appendicitis



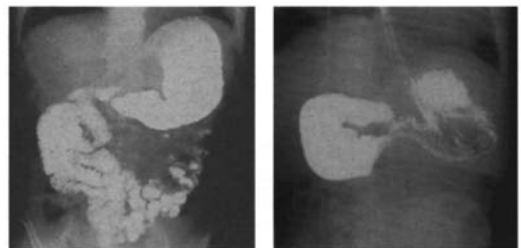
Inguinal Hernia



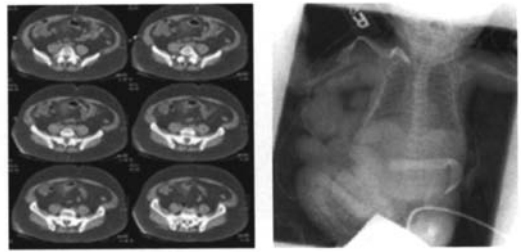
Intussusception



Malrotation with volvulus



Meckels/misc

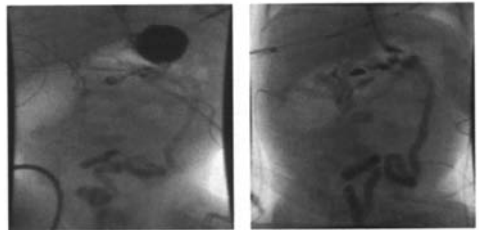


MICROCOLON

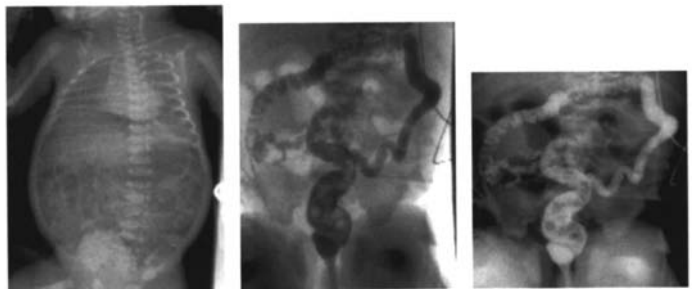
EVALUATE LEVEL OF DISEASE FROM LEVEL OF OBSTRUCTION:

RECTUM → SIGMOID → LEFT COLON → RIGHT COLON → TERMINAL ILEUM

Microcolon secondary to proximal atresia



Hirschsprungs (rectum)



Meconium plug/Small left colon syndrome (left colon)



Colonic atresia (entire colon)

Ileal Atresia (entire colon)

Meconium ileus

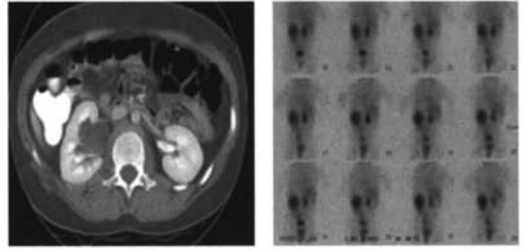
Jejunal atresia

MgSO₄

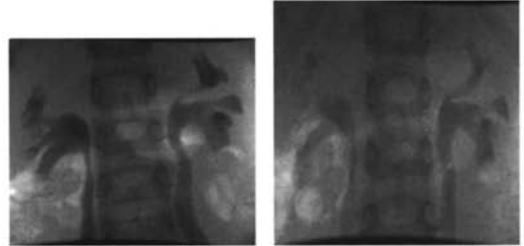
Infant of a diabetic mother

HYDRONEPHROSIS

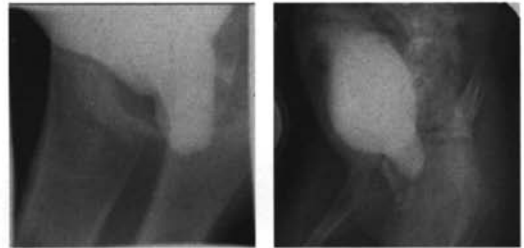
UPJ



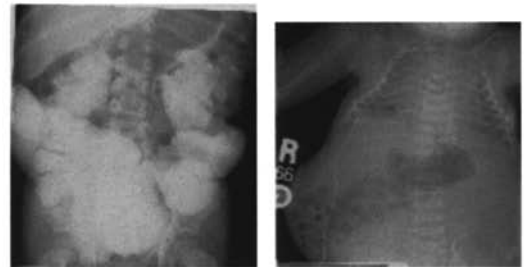
Reflux



Posterior urethral valves



Ectopic ureterocele
Prune belly

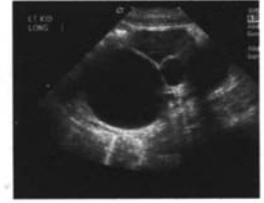


Primary megaureter
MCDK



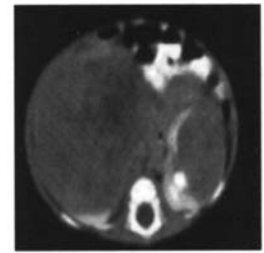
RENAL CYSTIC DISEASE

- MCDK
- Juvenile nephronopthosis
- APCKD
- ARPKD
- Glomerulocystic disease
- Obstructive lesions
- NUCS CAN DIFFERENTIATE FCN/Non FCN

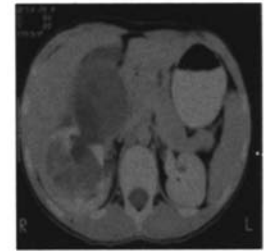


RENAL MASS

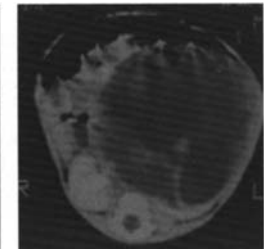
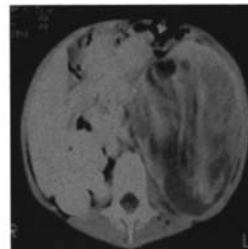
Wilms—(chest mets) (>1 yr)



Rhabdoid—(brain mets) (1 yr)



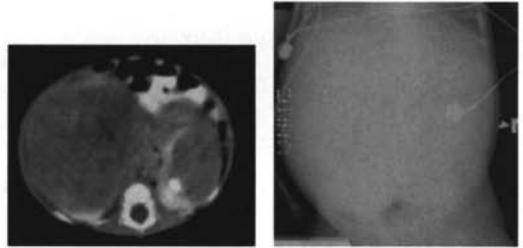
Clear cell sarcoma—(bone mets) (1 yr)
Mesoblastic nephroma



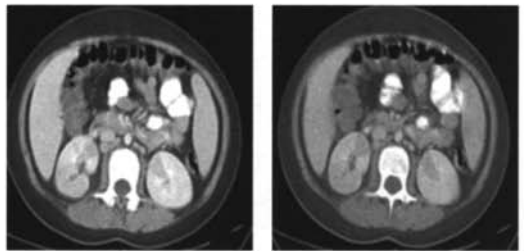
- Multilocular cystic nephroma
- RCC (>3 yr)
- Renal medullary carcinoma (sickle cell disease)
- Pyelonephritis

BILATERAL RENAL MASSES

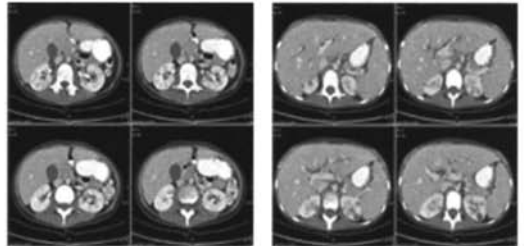
Nephroblastomatosis



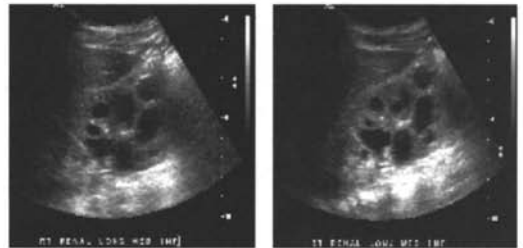
Pyelonephritis



Lymphoma/mets

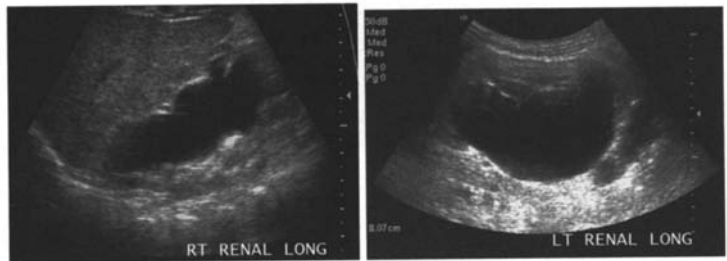


Infarcts
Cysts

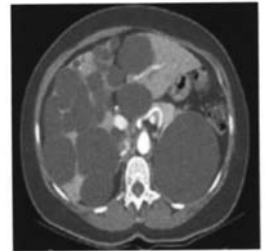


BILATERAL ENLARGED KIDNEYS

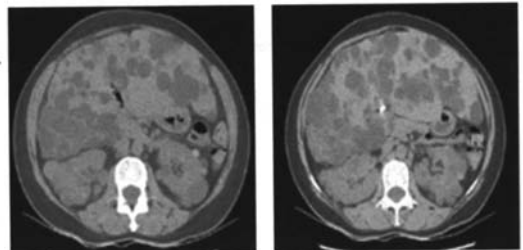
Bilateral hydronephrosis



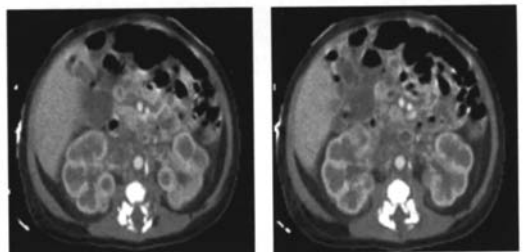
Glomerulonephritis
ARPKD



ADPKD



Bilateral renal vein thrombosis

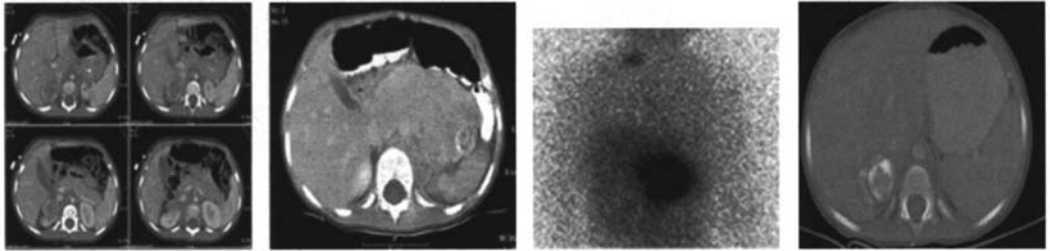


Nephroblastomatosis
Beckwith Weidemann

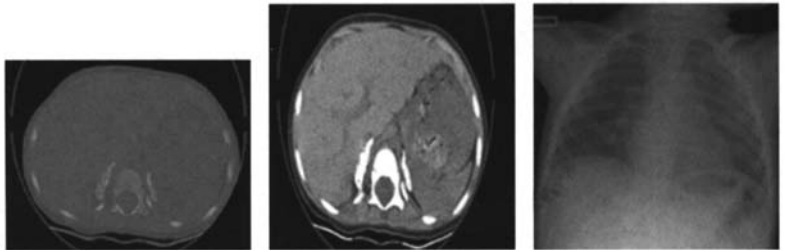
ADRENAL MASS

NAP

Neuroblastoma



Adrenal hemorrhage/Adrenal cortical carcinoma

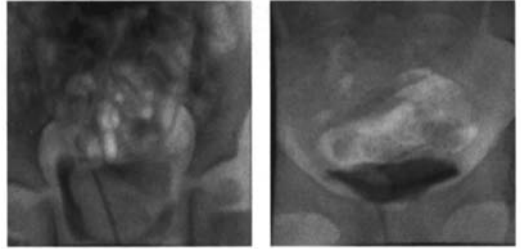


Pheochromocytoma

BLADDER MASS

FUR

- Fibroepithelial polyp
- Ureterocele



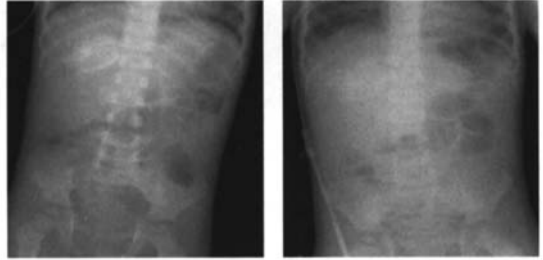
Rhabdomyosarcoma



ABDOMINAL CALCIFICATION

L-M-N

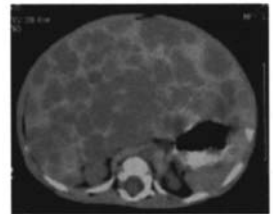
Liver
Meconium peritonitis
Neuroblastoma



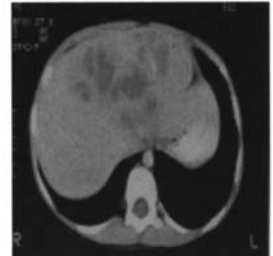
LIVER MASS

NEWBORN

Infantile hemangioma (solid)

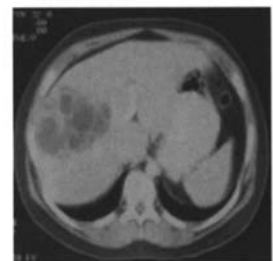


Hepatoblastoma (solid)
Embryonal cell sarcoma (mixed)



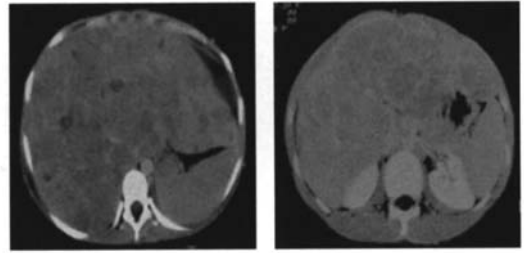
1 YR

Mesenchymal hamartoma (cystic)



>3 YR

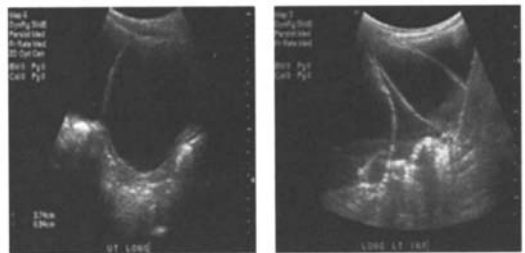
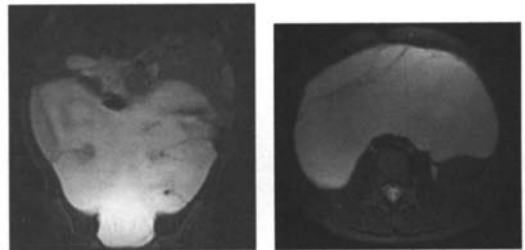
Hepatocellular carcinoma (variable)



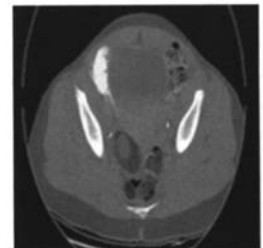
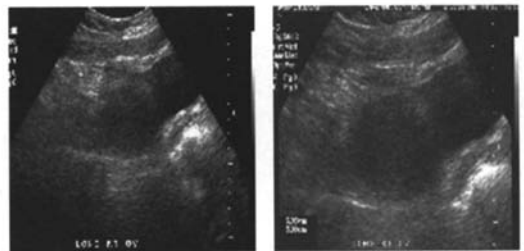
CYSTIC ABDOMINAL MASS

ECHO™

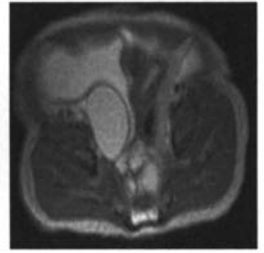
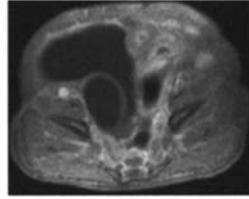
- Enteric duplication
- Choledochal cyst/mesenteric cyst
- Hydrocolpos



Ovarian cyst



Teratoma
Meconium pseudocyst

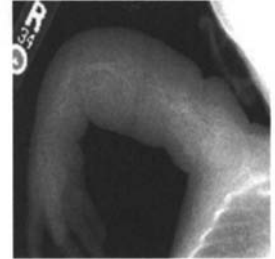


Musculoskeletal

MULTIPLE FRACTURES

SHOT

- Scurvy
- Hypophosphatasia
- OI
- Trauma



DIFFUSE PERIOSTEAL REACTION

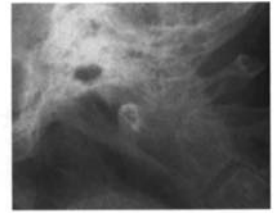
SCALPR

- Scurvy/infection
- Caffey
- Accidental trauma
- Leukemia
- PGE2
- Rickets



ATLANTOAXIAL WIDENING

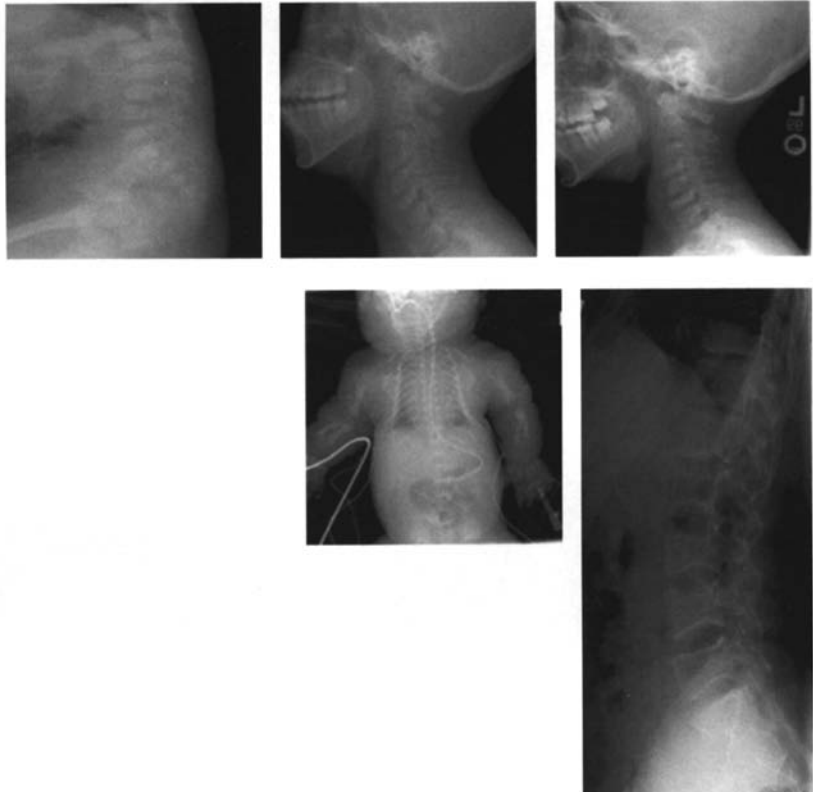
- Downs
- JRA
- Morquio
- Trauma



PLATYSPONDYLY

MODIC

- Morquio
- Osteogenesis imperfecta
- Dwarf (thanatophoric)
- Cushing's syndrome



POST VB SCALLOPING

SALMON

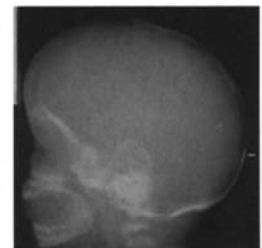
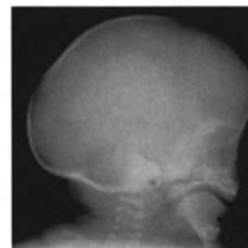
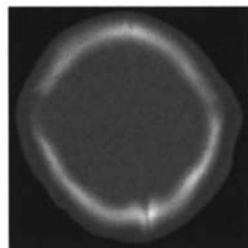
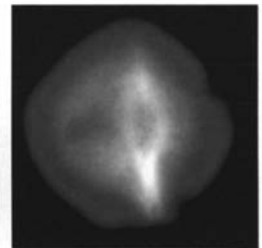
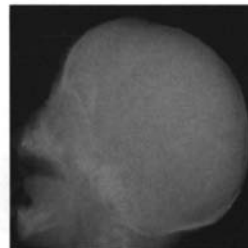
- Spinal cord tumor
- Achondroplasia
- Mucopolysaccharidosis
- Osteogenesis imperfecta
- Neurofibromatosis



SKULL

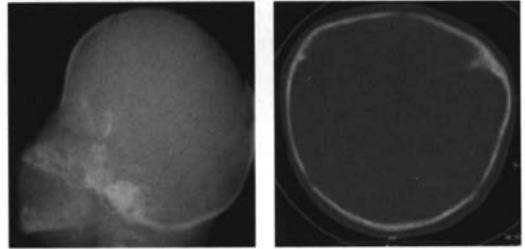
1. SCAPHOCEPHALY = DOLICOCEPHALY

Premature closure of sagittal suture (long skull)



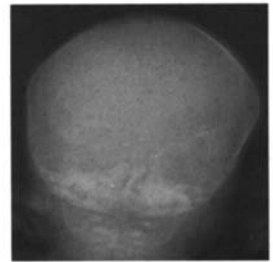
2. BRACHYCEPHALY = TURRICEPHALY

Premature closure of coronal/lambdoid sutures (short tall skull)



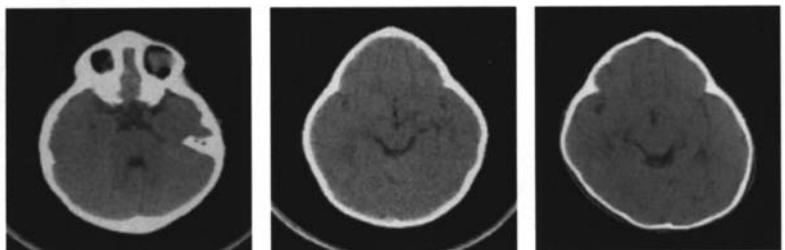
3. PLAGIOCEPHALY

Unilateral early fusion of coronal/lambdoidal suture (lopsided skull)



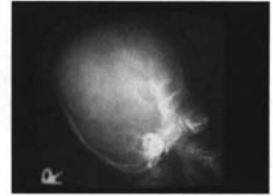
4. TRIGONOCEPHALY

Premature closure of metopic suture (forward pointing skull)



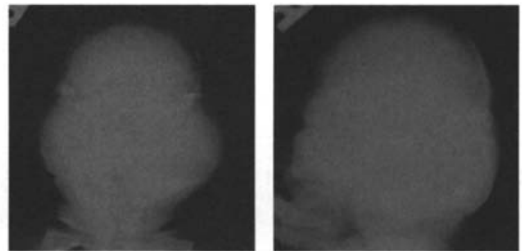
5. OXYCEPHALY

Premature closure of coronal, sagittal, lambdoid sutures



6. CLOVERLEAF SKULL = KLEEBLATTSCHÄDEL

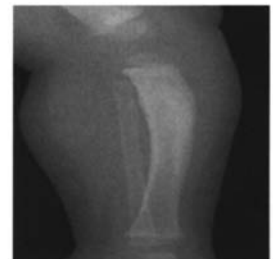
Intrauterine premature closure of sagittal, coronal, lambdoid sutures



TIBIAL BOWING

FONAR

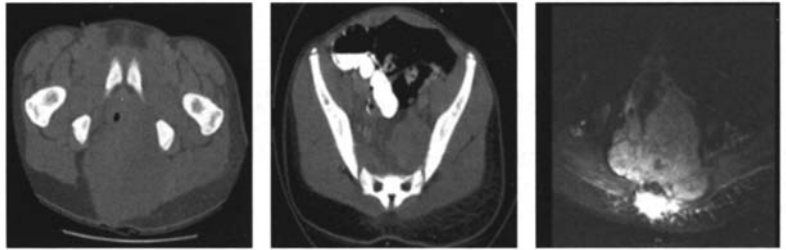
- Fibrous dysplasia
- Osteogenesis imperfecta
- Neurofibromatosis
- Achondroplasia
- Rickets



SACRAL MASS

KIDS WITH SACRAL MASSES RANT

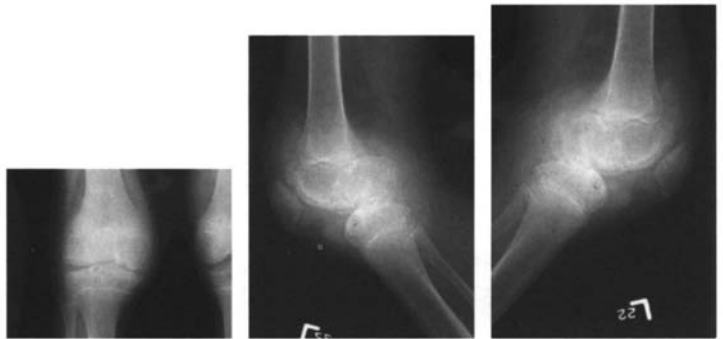
- Rectal duplication cyst
- Anterior meningocele
- Neuroblastoma
- Teratoma



KNEE

POSSIBLE CASES:

- Trauma
- JRA
- Hemophilia
- TB/infection
- Trevor's disease



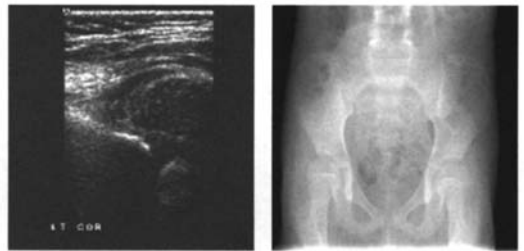
HIP

POSSIBLE CASES

Septic effusion
Toxic synovitis



Congenital dysplasia hip (neonate/infant)



Legg Calve Perthes (school age)



Slipped capital femoral epiphysis (adolescent)



FRAGMENTED EPIPHYSIS

TWILL

- Trauma
- Warfarin
- Infection
- Legg Calve Perthes
- Leg dysplasia



RADIAL RAY

- TAR
- Holt Oram
- Fanconi's anemia
- Poland

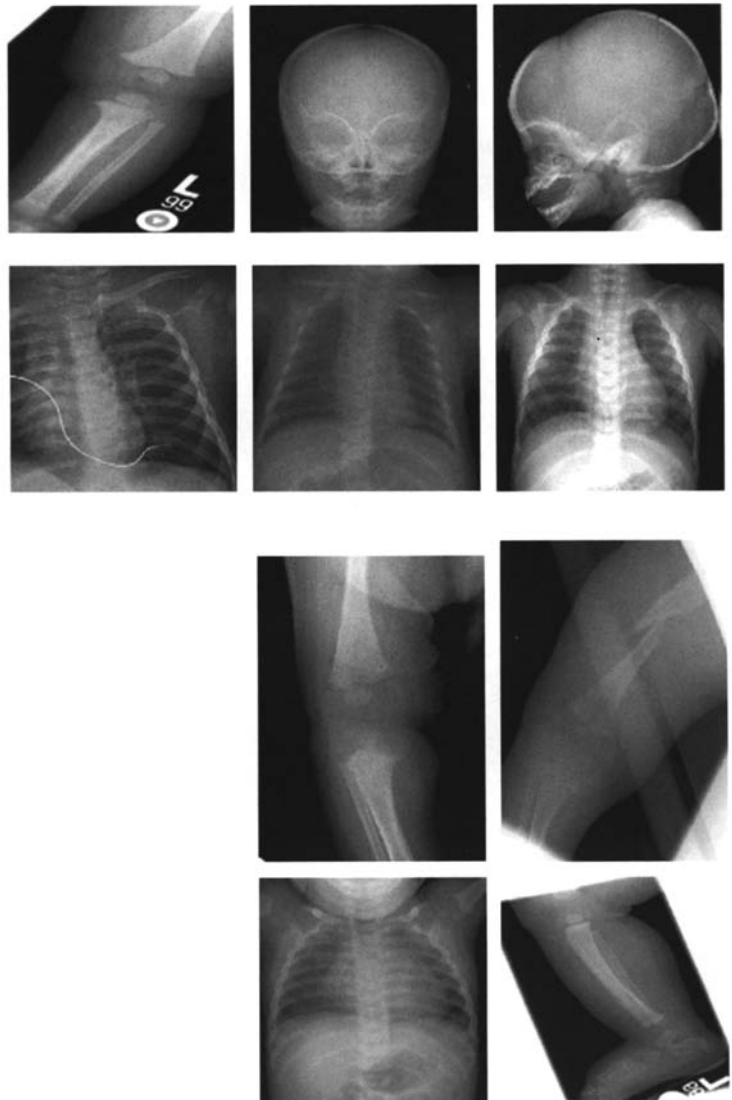


POLYDACTYLY

Familial
Trisomy 13
Lawrence-Moon-Bardet-Biedel



ABUSE



VIEWS:

AP/LAT Axial skeleton: skull, spine, sternum

AP: Appendicular skeleton

HIGH SPECIFICITY

Spinous process

Sternum

Scapula

Post Rib

INTERMEDIATE SPECIFICITY

Multiple fractures in various stages of healing

Hand/wrist injury

C-Spine

LOW SPECIFICITY

Midshaft fractures

Nonspiral fractures

10

BREAST

1. PARENCHYMAL PATTERN ASSESSMENT

1. The breast is almost entirely fat.
2. There are scattered fibroglandular densities.
3. The breast tissue is heterogeneously dense, which may lower sensitivity of mammography.
4. The breast tissue is extremely dense, which could obscure a lesion on mammography.

2. MASSES ASSESSMENT

ROLIA AND COMIS

Round
Oval
Lobulated
Irregular
Architectural distortion
Circumscribed
Obscured
Microlobulated
Indistinct
Spiculated

3. WORKUP NONPALP MASS

1. MAG VIEWS
2. **RO** (Round or Oval) 75% well circumscribed, not new, not bigger, not palpable
— 6 mo follow-up PB
3. Others:
— US — CYST
— Simple — STOP
— Complex — ASPIRATE

From: *Radiology: The Oral Boards Primer*
By: A. Mehta and D. P. Beall © Humana Press Inc., Totowa, NJ

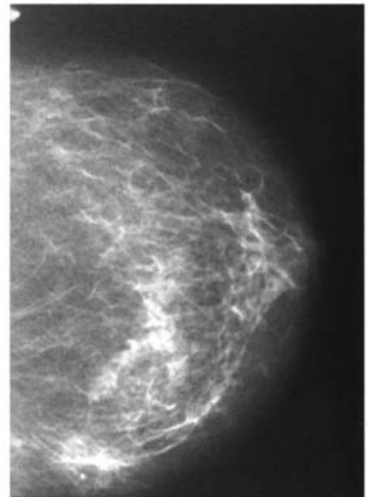
4. **LI** (lobulated or irregular) **BX**
5. **A**, Architec distortion
 - PRIOR SX? Yes—could be CA, scar, radial scar, overlap

If palp—same except US if negative mammo
Dec to bx if both negative—up to clinician

TRABECULAR THICKENING

Inflammatory carcinoma
Mastitis
Radiation
Lymphadema/CHF

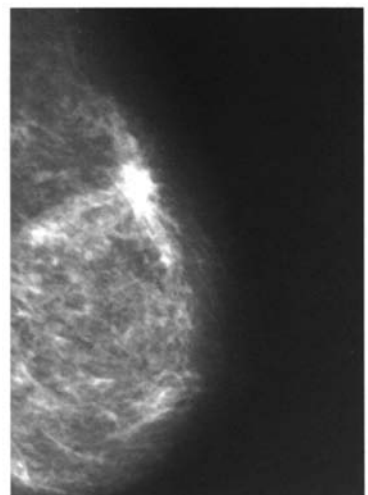
Punch BX



ARCHITECTURAL DISTORTION

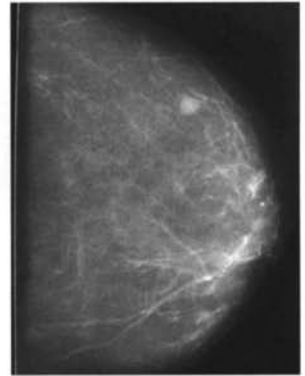
Carcinoma
Radial scar
Post Sx
Fat necrosis
Abscess

? HX SURGERY



CIRCUMSCRIBED MASS

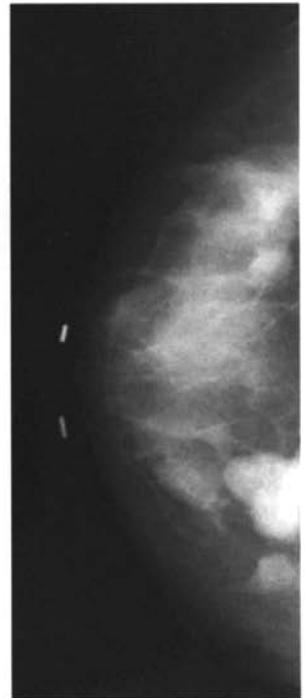
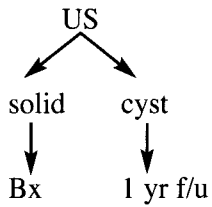
- Cyst
- Fibroadenoma
- Cancer
- Other—phyllloid/met/hematoma



MULTIPLE MASSES

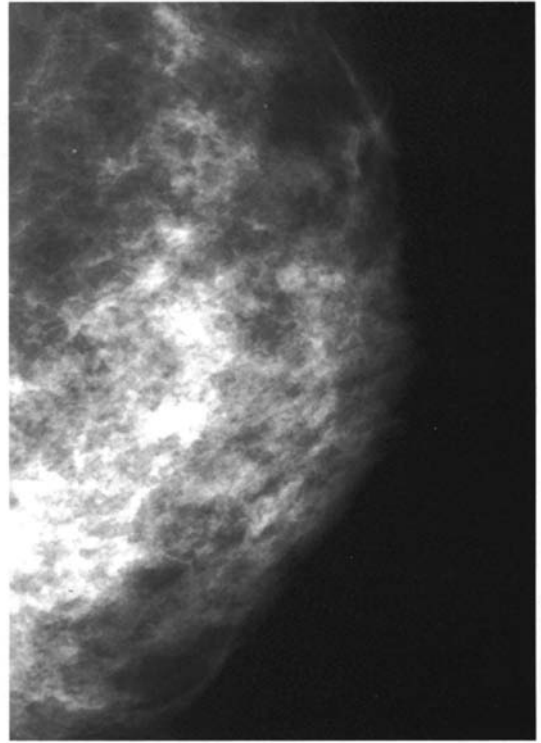
- Cysts
- Fibroadenomas
- Mets—melanoma/lymphoma/lung

- No HX malig 1 yr follow-up
- Hx malig



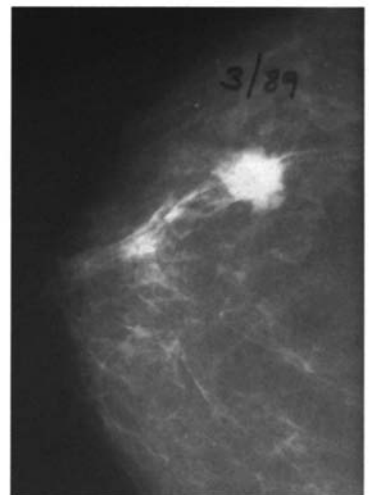
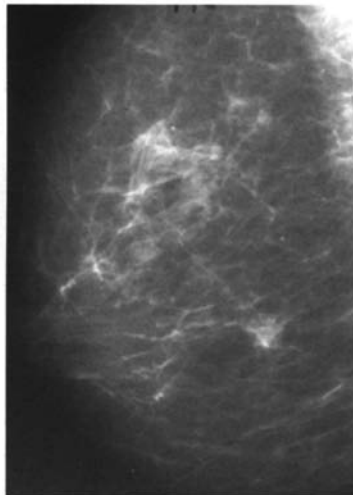
FAT CONTAINING LESION

- Hamartoma
- Galactocele
- Lipoma
- Oil cyst



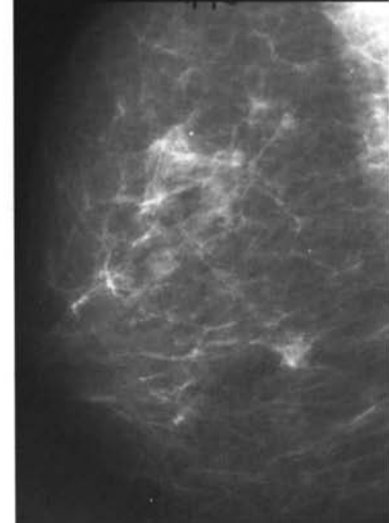
DEVELOPING DENSITY

- Carcinoma
- HRT
- Lymphoma
- Hematoma



CALCIFICATIONS

1. Identify
2. 90° VIEW to R/O MILK of calcium
3. BENIGN—STOP
 - a. Vascular
 - b. Popcorn
 - c. Large Rods
 - d. Lucent center
 - e. Eggshell
 - f. Suture
 - g. Dystrophic

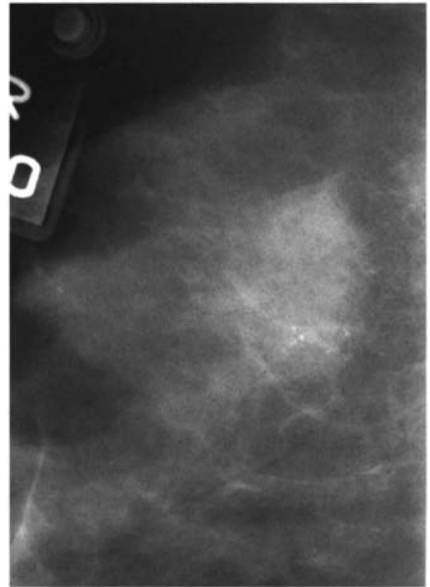


- 4. MALIGNANT—BX
- 5. Cluster round probably benign—6 mo follow-up



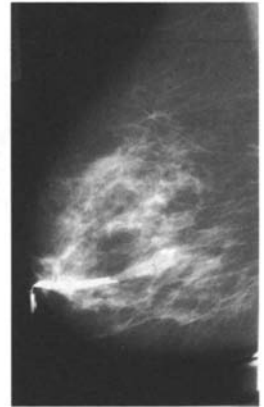
INDETERMINATE CALCS

- DCIS
- Fibrocystic change, Sclerosing adenosis
- Fat necrosis

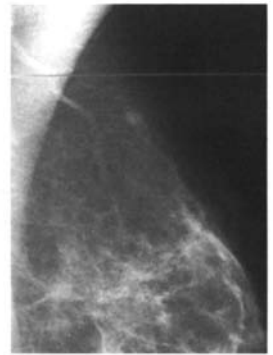


SPECIAL**TUBULAR DENSITY/DUCT**

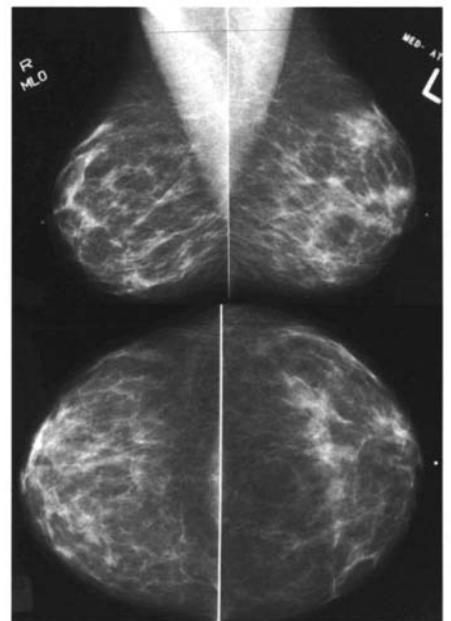
Nipple D/C → Serous/Bloody → US/Galactogram
 Asymptomatic → STOP

**INTRAMAMMARY LYMPH NODE**

Lateral outer → Mag view fatty hilum → STOP

**ASYMMETRIC BREAST TISSUE**

1. No calc.
2. No mass.
3. No central density.
4. No distorted architecture.



FOCAL ASYMMETRIC DENSITY

? LOBULAR CARCINOMA

A. SIMILAR SHAPE ON TWO VIEWS.

B. CANNOT BE DESCRIBED WITH “ROLIA” AND “COMIS” (see p. 305)

1. No borders, convex outward.
2. No conspicuity of a true mass, changes on two views.
3. Variable density.
4. Nonpalpable.

C. MAG-ISLAND OF NORMAL BREAST TISSUE WILL RESOLVE

If does not resolve.

D. ULTRASOUND

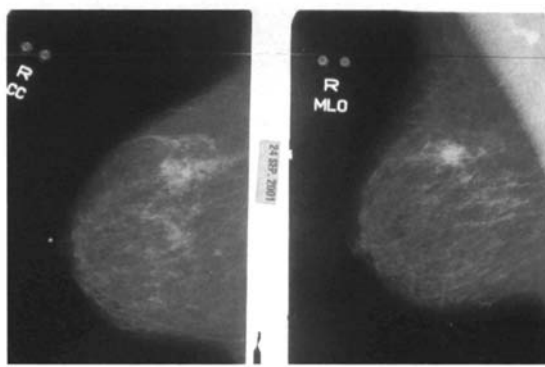
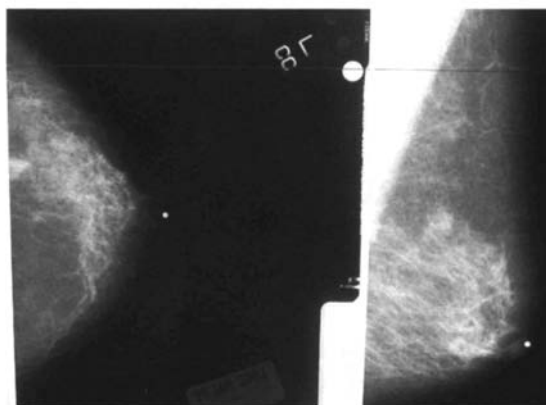
ABN NORMAL

↓

BX

↓

consider HORMONE TX, If yes STOP for 3 mo. Repeat if no FOLLOW or BX (new/increasing).



ULTRASOUND

1. Skin
2. Superficial Fascia— Superf and Deep
 - a. Fat b/w the skin and superfic
 - b. Coopers b/w two layers
3. Mammary Gland
4. Retromammary Space (post to deep layer of the superficial fascia)
5. Pec Major/minor
6. Rib

CYSTS

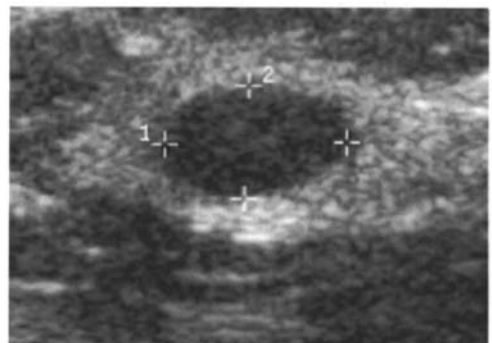
SIMPLE

1. Completely anechoic
2. Smooth walls
3. Sharp ant and post borders
4. Post-acoustic enhancement



COMPLEX

1. Abscess
2. Debris
3. Intracystic tumor (papilloma, papillary carcinoma)
4. Fat necrosis



MASSES

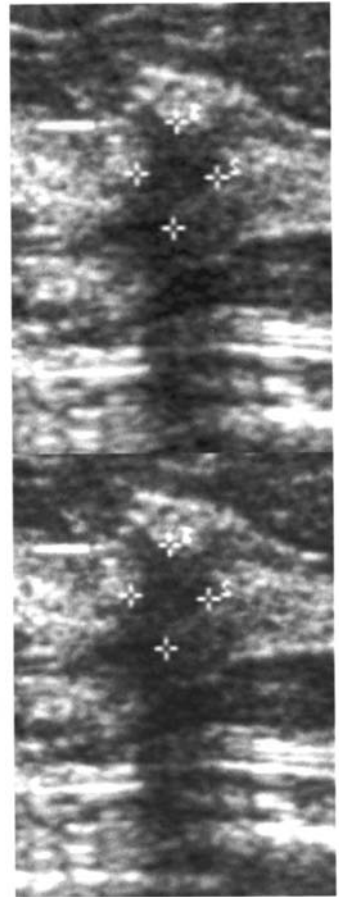
THRU TRANSMIT

1. Fibroadenoma
2. Medullary carcinoma
3. Papillary carcinoma
4. Metastatic lymphoma



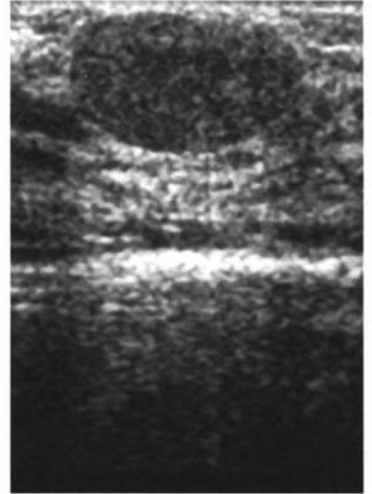
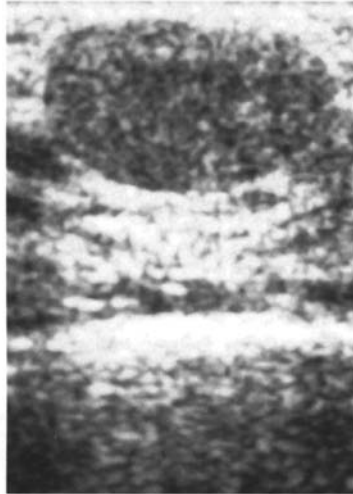
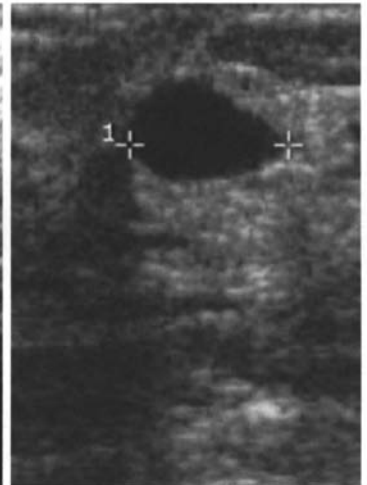
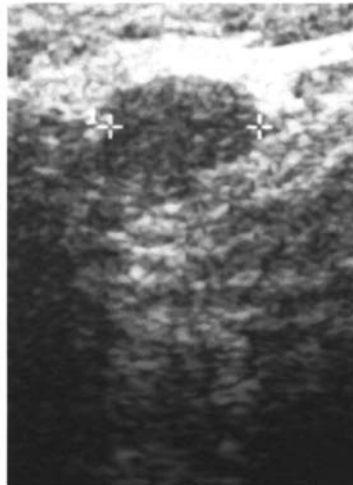
MALIGNANT MASS

1. Spiculation
2. Taller than wide
3. Angular margins
4. Hypoechoic to fat
5. Shadow
6. Duct extension
7. Microlobulation



BENIGN MASS

1. No malignant features
2. Intense, uniform echog
3. Ellipsoid plus capsule
4. Three or fewer gentle lobulations

**INDETERMINATE**

Stereotactic Biopsies

CONTRAINDICATIONS

1. Breast doesn't compress
2. Cant get to lesion
3. Radial Scar/Arch distortion
4. Patient cannot lie prone

11

Neuroradiology

Includes plain film diagnosis of the skull, sinuses, mastoids, spine and head, and neck structures, and all other imaging and special procedures related to the central nervous system and head and neck including angiography, myelography, interventional techniques, and magnetic resonance imaging.

IN GENERAL, EVERY CASE WILL FALL INTO:

1. Tumor
2. Infarct (arterial or venous)
3. Infection
4. Vascular
5. Congenital
6. Inflammatory

EVERY CASE TO PREVENT FAILING THE SECTION:

1. IS IT VASCULAR?
2. IS THERE HERNIATION?

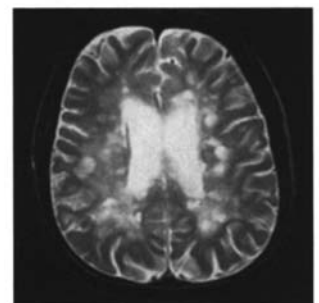
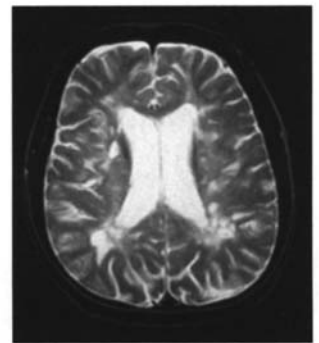
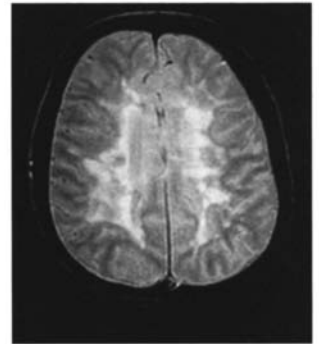
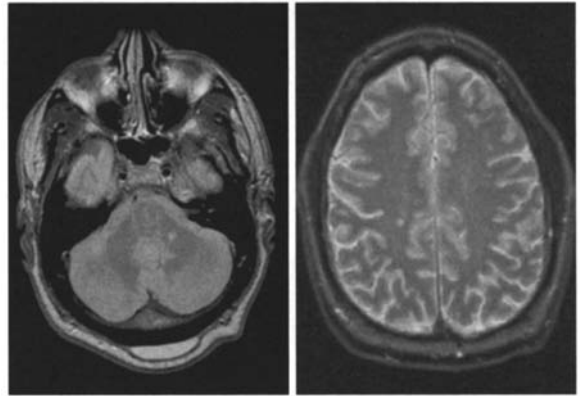
White Matter

DEMYELINATING

Cortical

LATE VIDEO

- Lymphoma
- ADEM
- Trauma
- Elderly-nonspecific periventricular
- Vasculitis
- Infections HIV/Herpes/PML
- Demyelinating
- Eclampsia
- Other—Radiation Tx



Brainstem

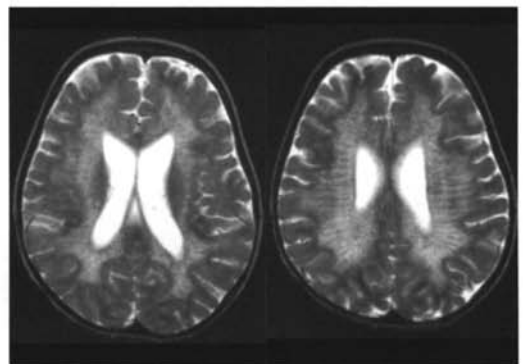
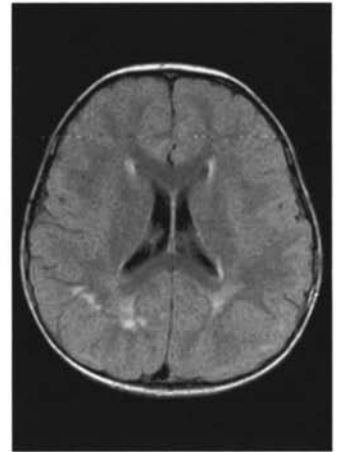
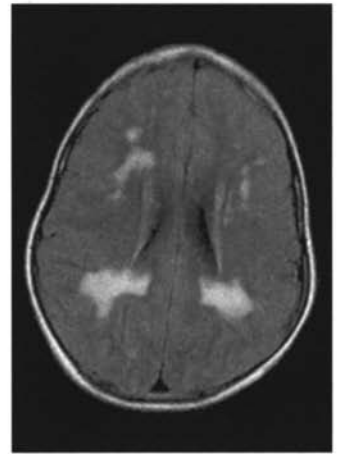
Central Pontine Myelinolysis



DYSMYELINATING

LACK OF Proper Myelination

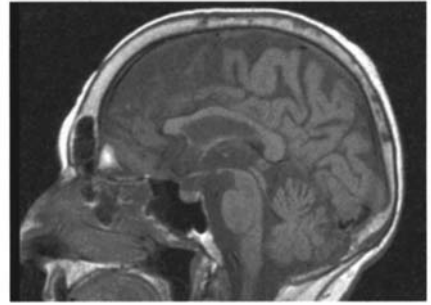
- Leigh (Leigh's **PUTATO** chips)
 - **P**utamen, periventricular, subcortical
- Adrenoleukodystrophy — Posterior
- Alexander — Big head, Frontal
- Canavan — Big Head, Subcortical
- Krabbe — Thalami
- Pelizeus Merzbacher — Diffuse
- Metachromic Leuko — Cerebellar+BG



ATROPHY

CORTICAL

Senile dementia Alzheimer's type
Ischemic/Vascular
Picks



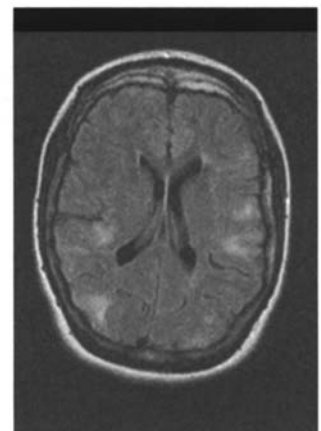
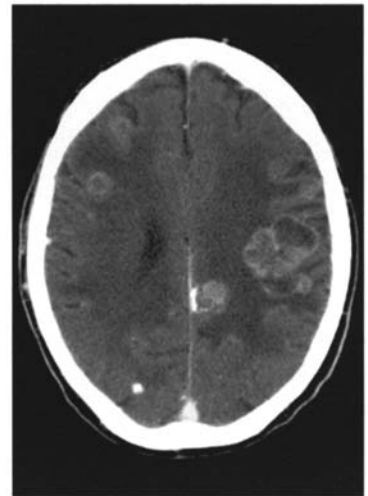
BASAL GANGLIA/OTHER

Parkinson's

MULTIPLE MASSES

MAILMAN

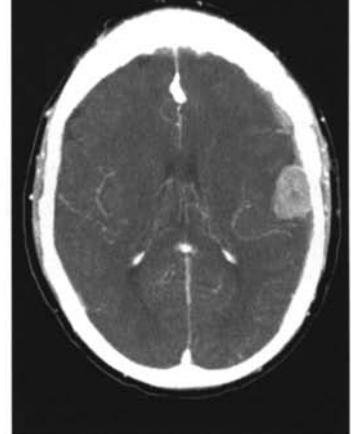
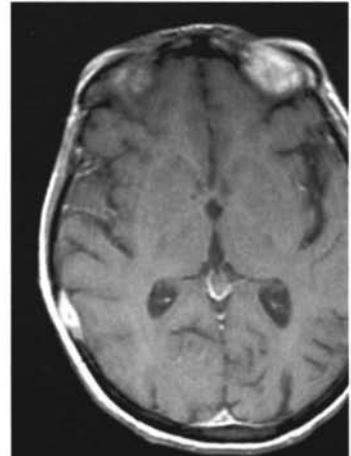
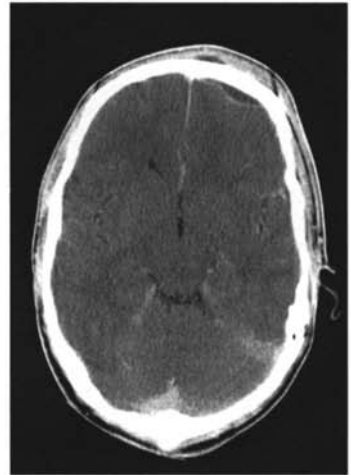
Metastasis
Angiomas—Vascular malformations
Infarction/infection
Lymphoma
Multiple sclerosis
Abscesses
NF spots (remember the esoteric diagnoses)



EXTRA AXIAL MASS

MAD SALE

- Meningioma
- Abscess
- Dural metastasis—prostate/breast
- Sarcoidosis
- Abscess/AVM
- Lymphoma
- Epidermoid/dermoid



INTRA-AXIAL

Supratentorial

CHILD

TAPE

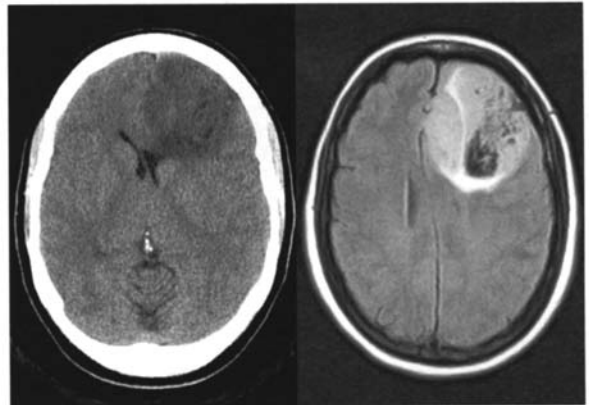
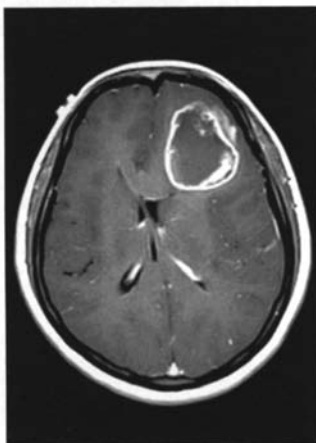
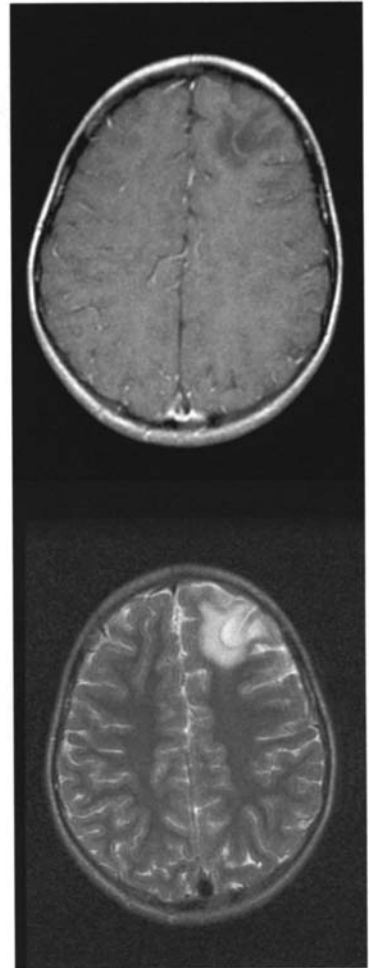
- Teratoma
- Astrocytoma
- PNET**
- Ependymoma

ADULT

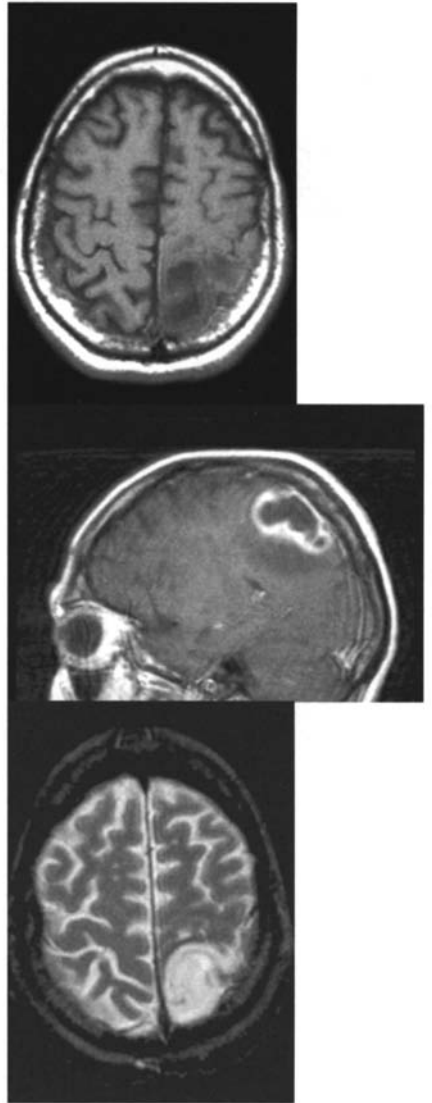
WHITE MATTER

OLD MAN

- Oligodendroglioma
- Lymphoma
- Dermoid
- Metastasis
- Astrocytoma
- Neuronal tumors



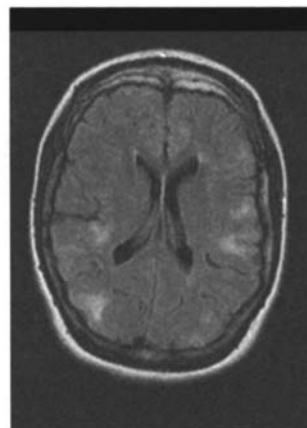
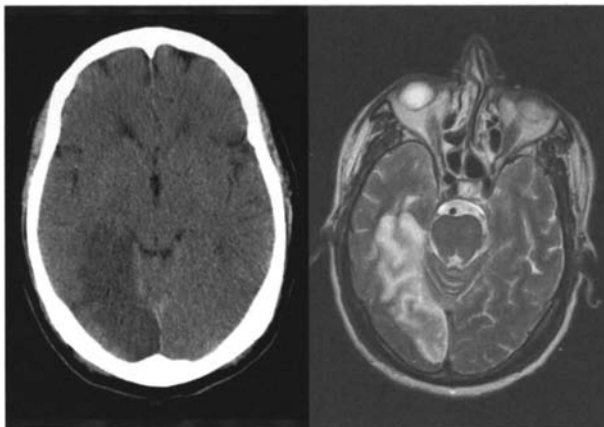
INFECTION



CORTICAL

TIGER TIM

- Trauma
- Infarct
- Ganglioglioma/glioma
- Encephalitis
- Radiation
- Tubers
- Infection—toxoplasmosis
- Metastasis



Infratentorial**CHILD***Cerebellum*

Medulloblastoma—(precontrast hyperintense)

Ependymoma—(Ca^{2+})(cystic)

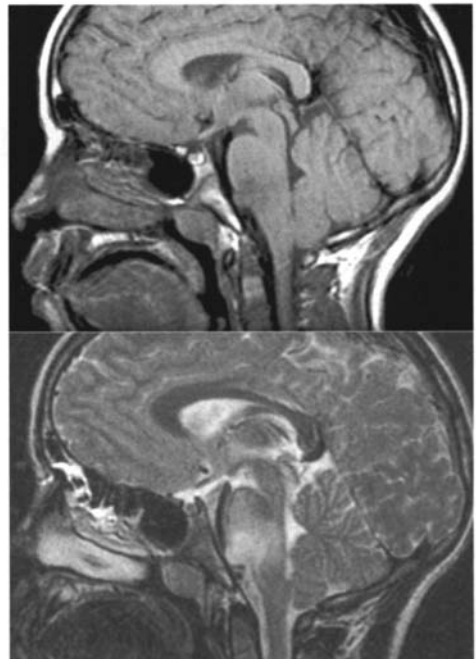
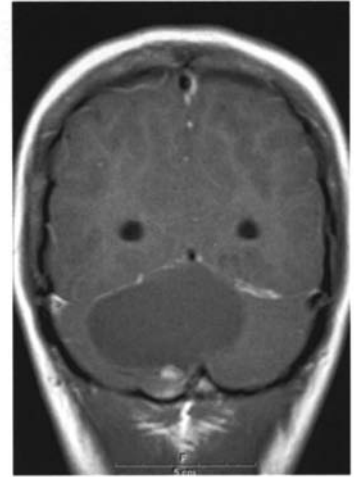
JPA

Mets

Choroid plexus papilloma

Brainstem

Brainstem glioma+tectal glioma



ADULT

Cerebellum

- Mets
- Hemangioblastoma
- Astrocytoma
- Choroid plexus C/P
- Lymphoma



Brainstem

Tumor

- Metastasis
- Brainstem Glioma

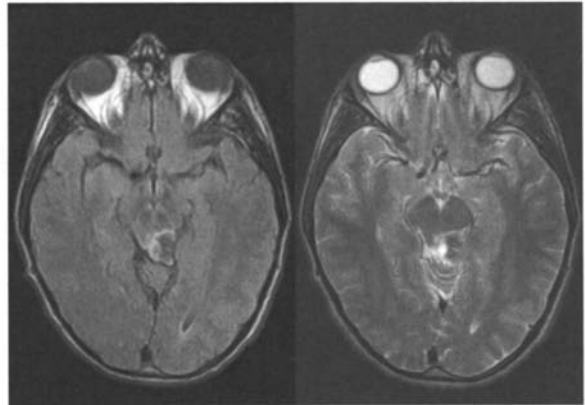
Infection

- Tb
- Abscess

Inflammatory/Vascular

- Cavernoma/AVM
- Infarct

Demyelinating

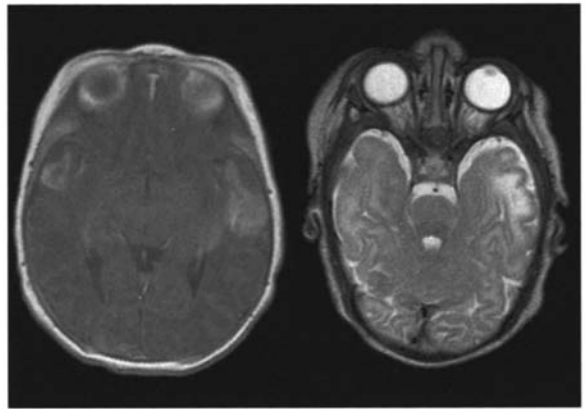


TEMPORAL LOBE

Tumor: Ganglioglioma

Infection: Herpes

Vascular: Transverse sinus
thrombosis/infarct



CALCIFIED TUMORS

OLD ELEPHANTS AGE GRACEFULLY AND LIKE PEANUTS

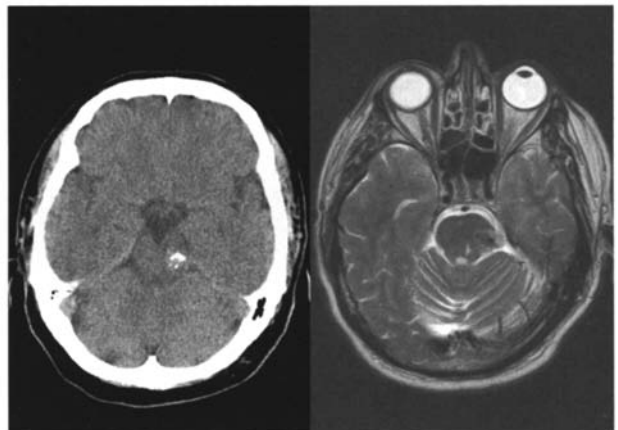
Oligo

Ependymoma

Astrocytoma

GBM

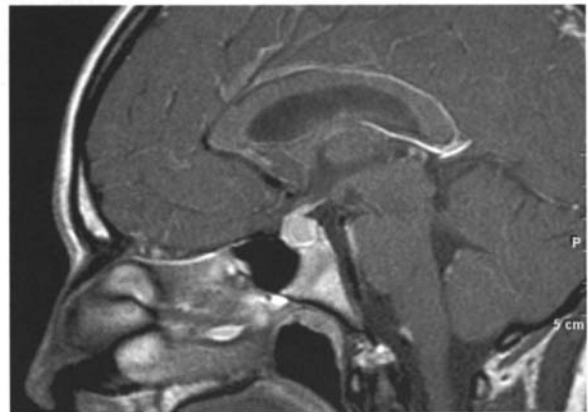
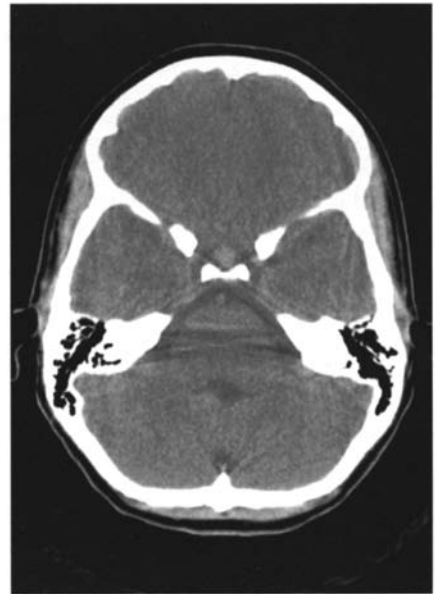
PNET



SELLAR

PC OR MAC?

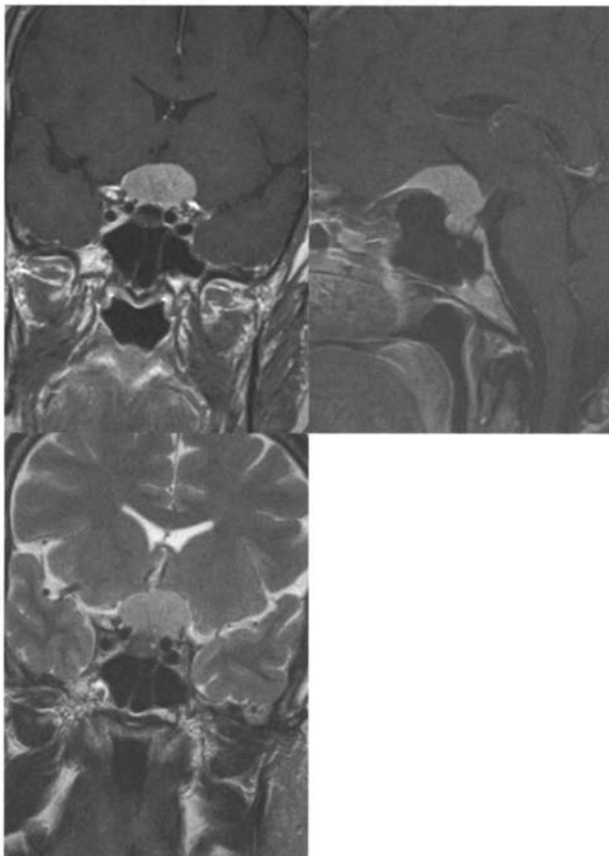
- Pituitary adenoma/apoplexy
- Craniopharyngioma
- Mets/meningioma
- Abscess/Aneurysm
- Cysts—Rathke's cleft



SUPRASELLAR

SATCHMOE

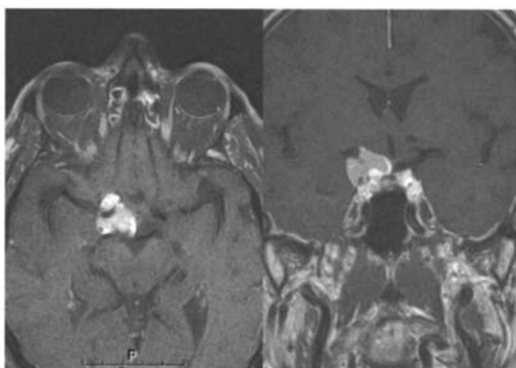
- Sarcoid
- Aneurysm
- Teratoma/germinoma
- Craniopharyngioma
- Hamartoma of the tuber cinereum
- Meningioma/mets
- Optic glioma
- EG



PARASELLAR MASS

MCAT

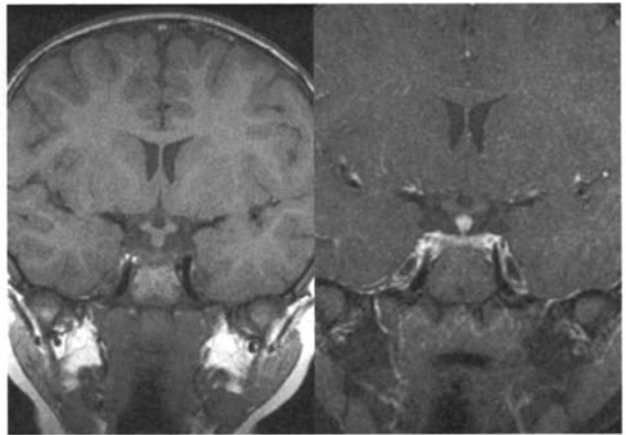
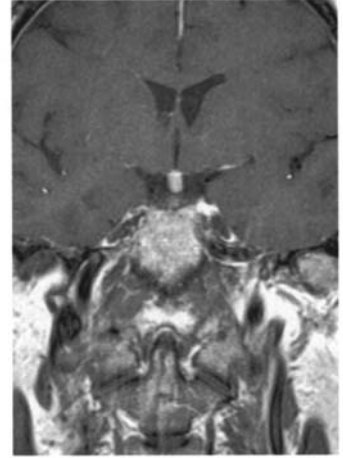
- Meningioma/metastasis
- Cavernous carotid fistula
- Aneurysm
- Trigeminal Schwannoma/Tolosa-Hunt



INFUNDIBULAR MASS

MEET GIRLS

- Metastasis
- Eosinophilic granuloma
- Germinoma/germ cell tumors
- Infection/inflammation (hypophysitis)
- DuRal—(think of dural-based conditions)
- Lymphoma
- Sarcoid

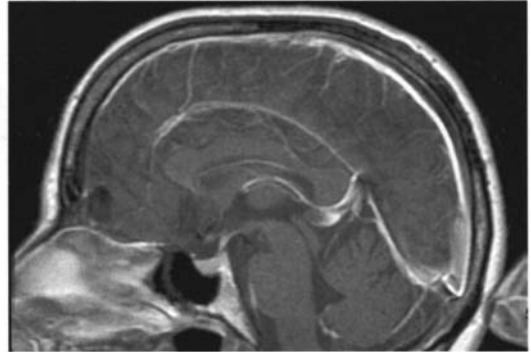
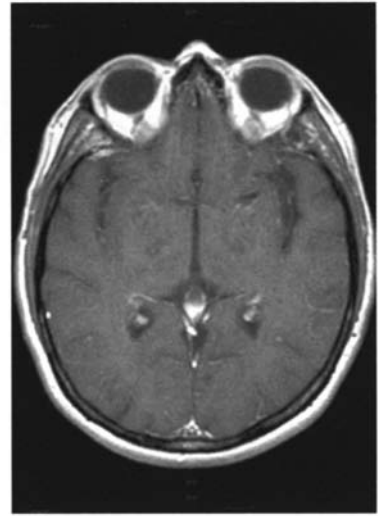


PINEAL MASS

MAD PIG

Meningioma/metastasis
Arachnoid cyst/Aneurysm/AVM
Dermoid/teratoma

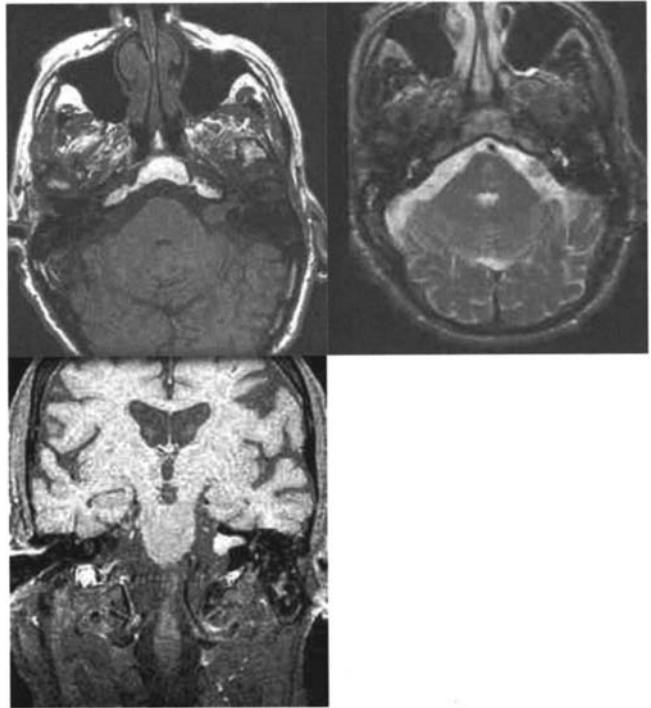
Pineal parenchymal tumor
Pineal cyst
Germ cell tumor/Glioma



CP ANGLE

SLOW GAME

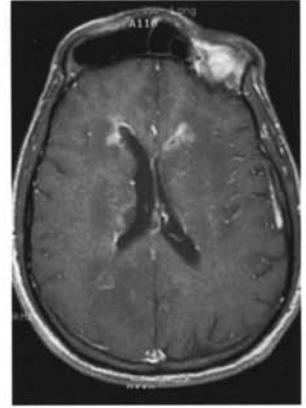
- Schwannoma: V and VII
- Lymphoma/lipoma
- Glomus tumor
- Aneurysm
- Meningioma/Metastasis
- Epidermoid/Ependymoma



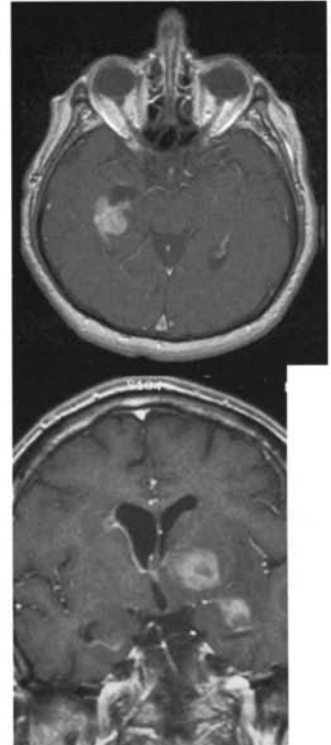
Ventricular Disorders

VENTRICULITIS

Infection—CMV/HIV/TB



Tumor—Carcinoma/metastasis/lymphoma

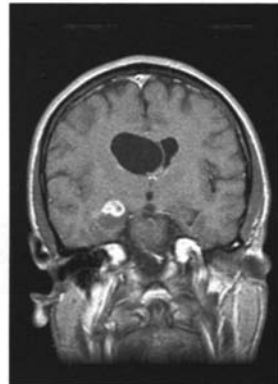
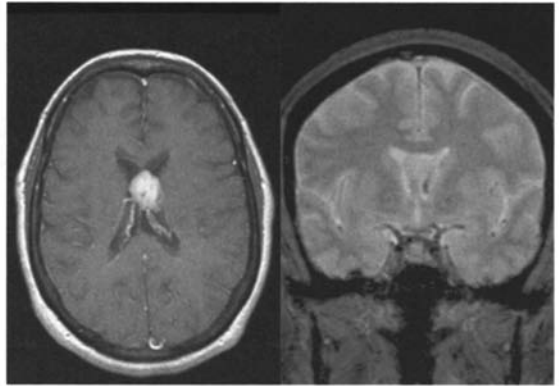


MASS

Adult

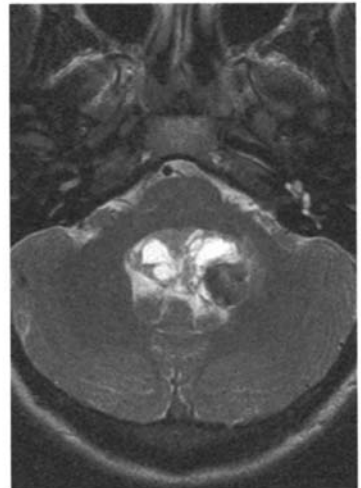
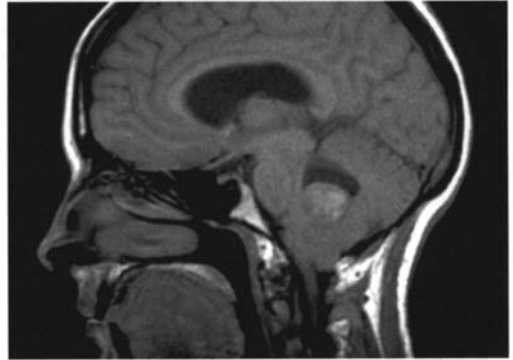
EMC²

- Ependymoma/Gliomas
- Mets/Meningioma
- Choroid plexus tumors
- Central neurocytoma/Cystercercosis



Child**PETA (save animals)**

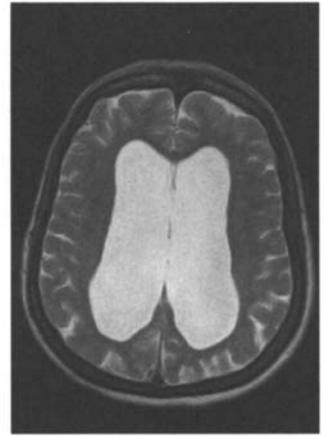
PNET
Ependymoma
Teratoma
Astrocytoma



HYDROCEPHALUS

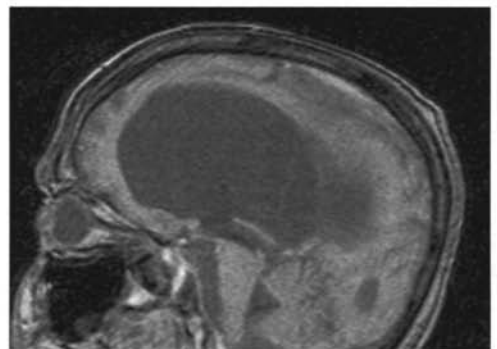
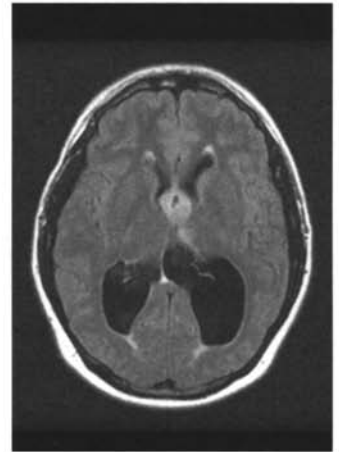
Communicating

- NPH (wet, wobbly, wacky)
- Meningitis
- Post subarachnoid hemorrhage
- Post surgery



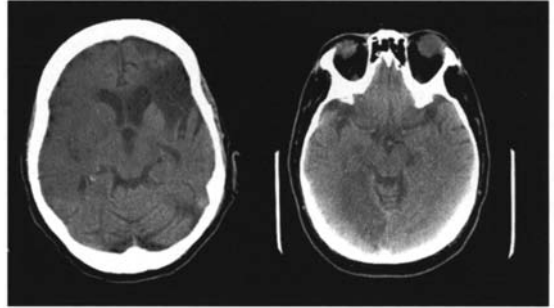
Noncommunicating

- 3rd ventricular mass
- Aqueductal tumors/stenosis
- 4th ventricular mass

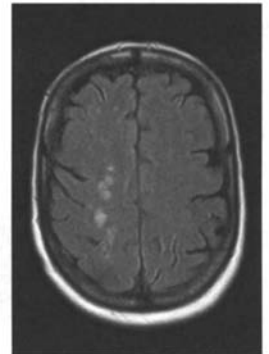


INFARCTS/STROKE

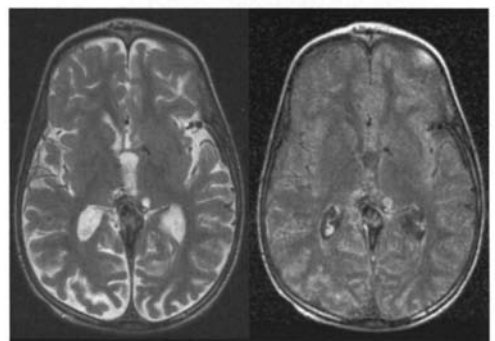
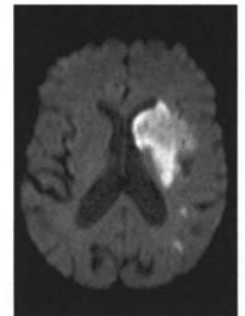
- 1. Large vessel—MCA/ACA/PCA



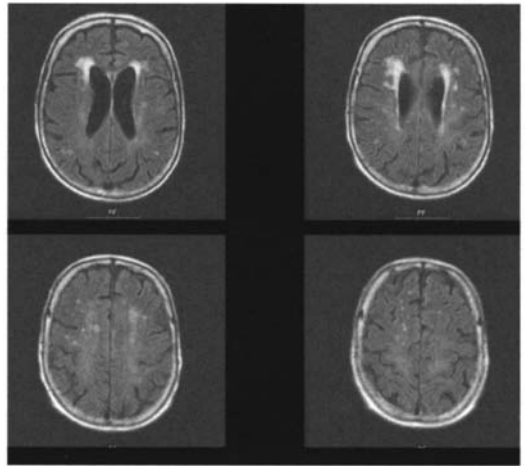
- 2. Watershed



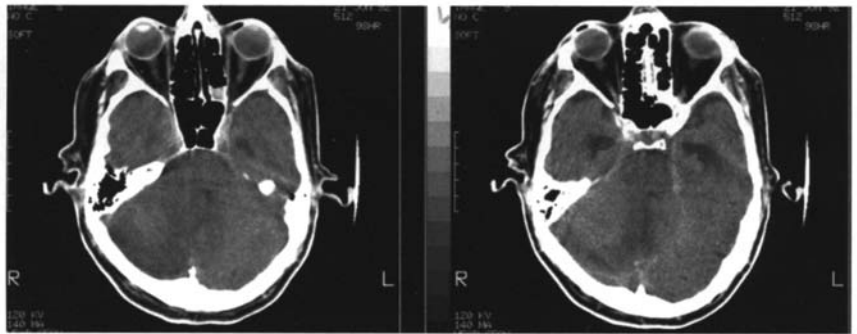
- 3. Small vessel disease—Lacunes. HTN



4. Microvascular—Leukariasis



5. Posterior fossa (may need to be decompressed)

**ARTERIAL CAUSES**

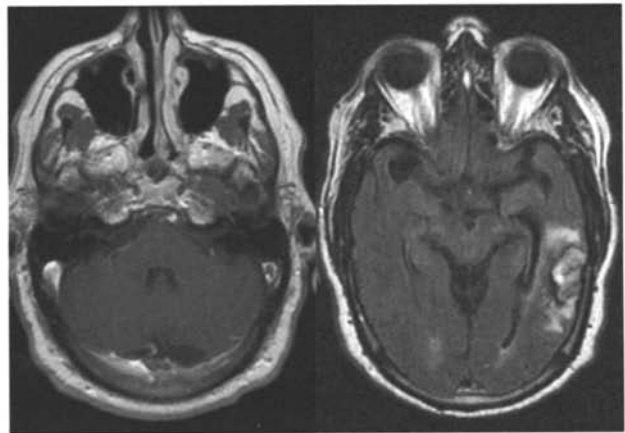
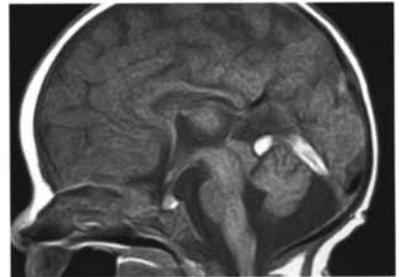
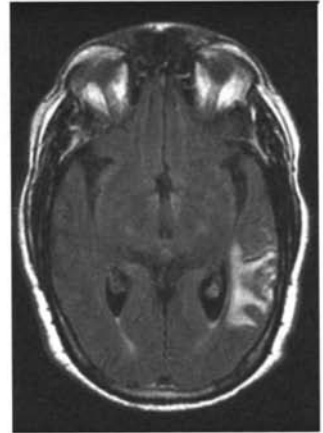
- Thrombosis/atherosclerosis
 - Check Circle of Willis/branch points
- Dissection—Check neck vessels
- Low flow—Check history
- Emboli-Drug history
- Vasculitis



VENOUS CAUSES

SHIPPED

- Sickle cell
- Hypercoaguable
- Infarct
- Infection
- Pregnancy
- Pill (oral contraceptives)
- Endogenous—Factor V Leiden
- Dehydration

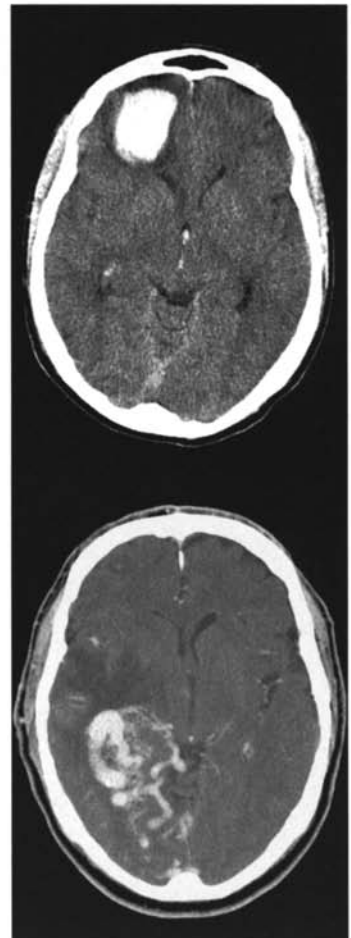
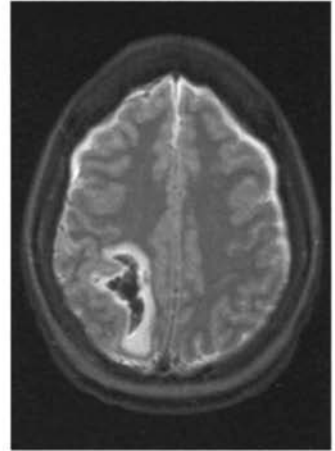


INTRAPARENCHYMAL HEMATOMA

Young

DATA

- Drug abuse—Cocaine
- Aneurysm
- Tumor—Underlying
- AVM/Vascular malformations



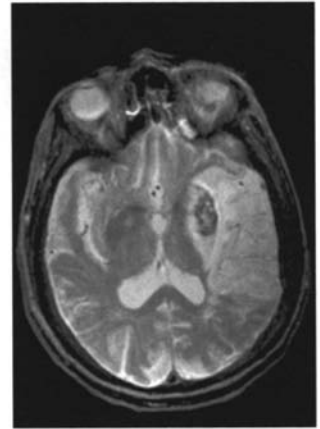
Old

HAT

HTN—putamen/thalamus/pons/cerebellum

Amyloid/Anticoagulation

Tumor—primary or metastasis



RING-ENHANCING LESION

MAGIC DR

Immunocompromised

Toxoplasmosis vs lymphoma

Immunocompetent

Mets

Abscess

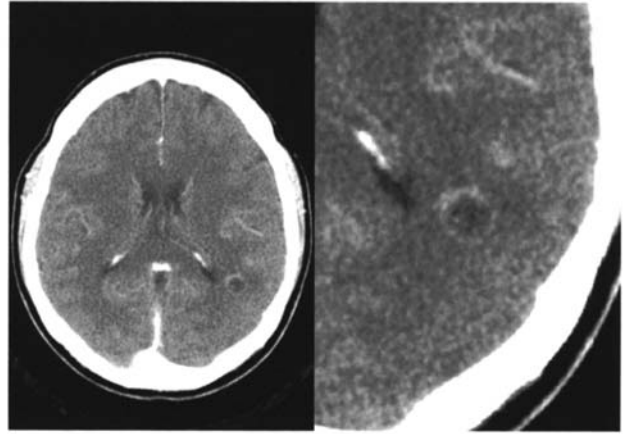
Glioma

Infarct

Contusion

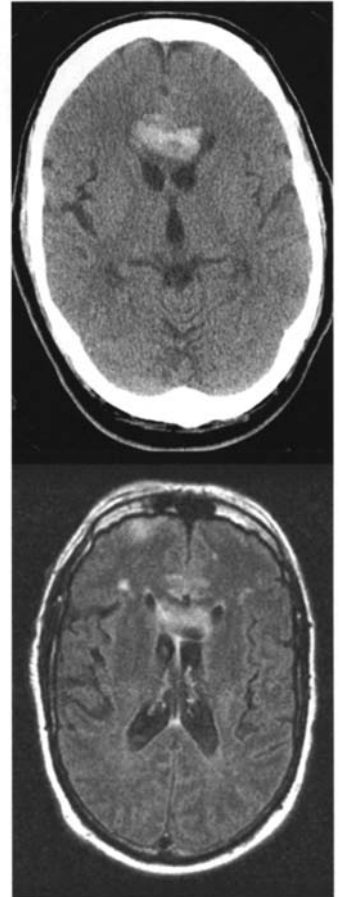
Demyelinating (MS)

Radiation Necrosis



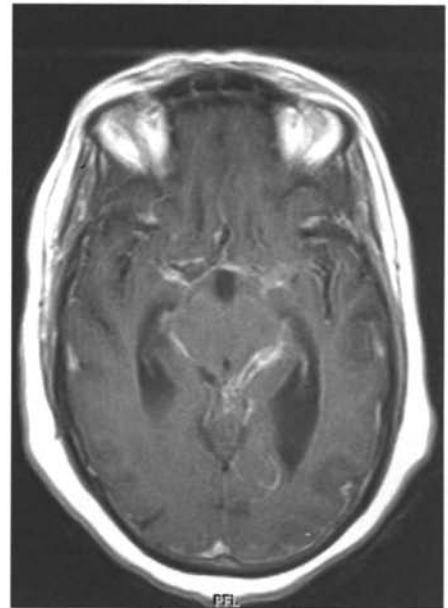
CROSSING LESIONS OF THE CORPUS CALLOSUM

- Lymphoma
- GBM
- MS
- ADEM/PML
- Trauma
- Metastases



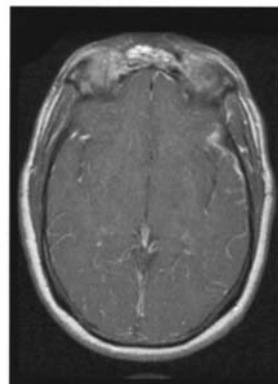
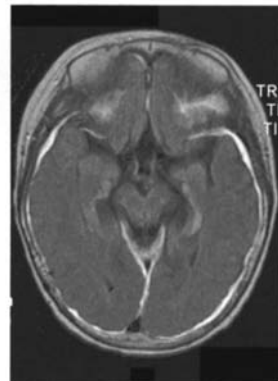
LEPTOMENINGEAL ENHANCEMENT

Carcinomatosis—breast/lung/melanoma
Infection—viral or bacterial meningitis/TB
Inflammatory—sarcoid
Consider subarachnoid hemorrhage
Spontaneous intracranial hypotension



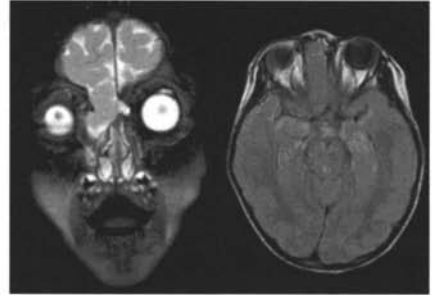
DURAL ENHANCEMENT

- Postoperative
- Spontaneous intracranial hypotension
- Metastatic disease—breast/prostate
- Sarcoidosis

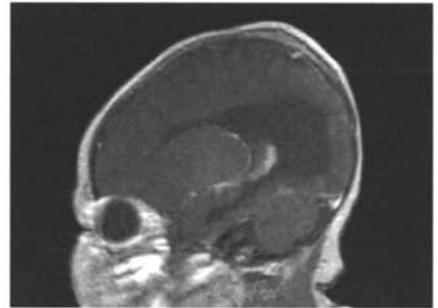


CONGENITAL***Children Complete Myelination at 2 yr of Age*****DISORDERS OF NEURAL TUBE CLOSURE**

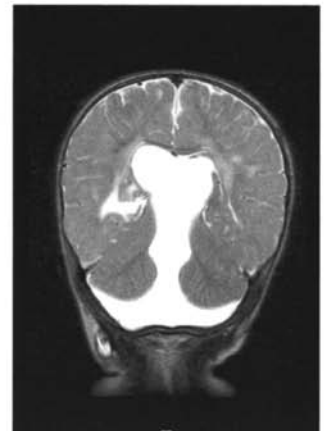
Cephalocele



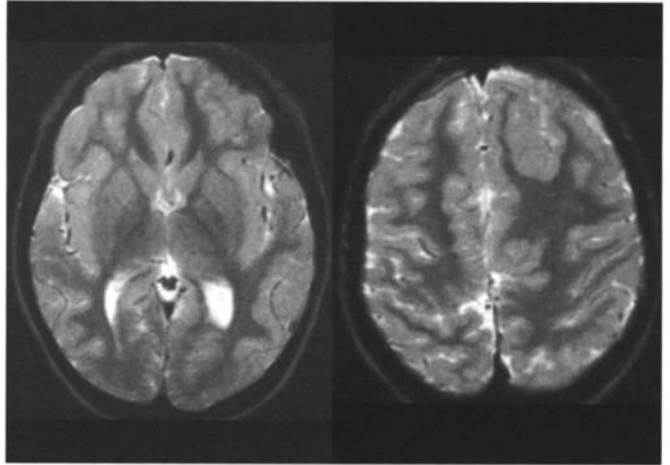
Corpus Callosal anomaly—Agenesis



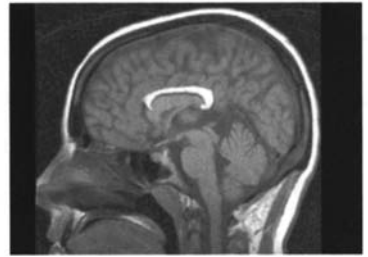
Dandy Walker malformation



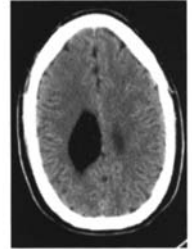
Chiari II
Migrational disease



Idiopathic
Lipomas



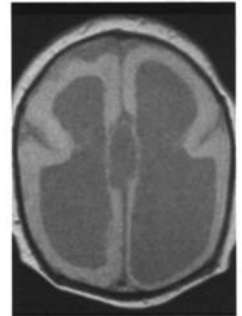
Cysts—Aicardi's syndrome
Hydranencephaly
Porencephaly—toxoplasmosis



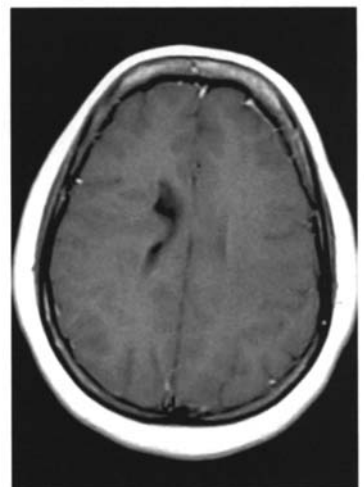
Dyke Davidoff Mason—unilateral atrophy

DISORDERS OF NEURONAL MIGRATION

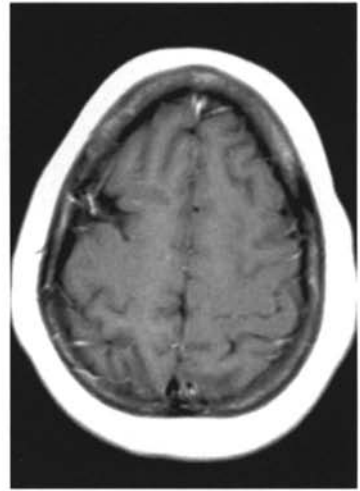
Lissencephaly
Nonlissencephalic cortical dysplasia
**ASSOCIATED WITH CMV—affinity for germinal matrix*



Heterotopia



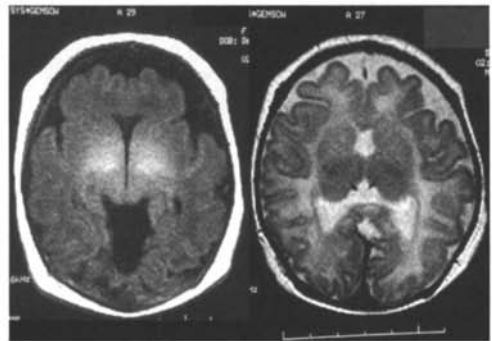
Schizencephaly



Unilateral megalencephaly

DISORDERS OF DIVERTICULATION

Holoprosencephaly



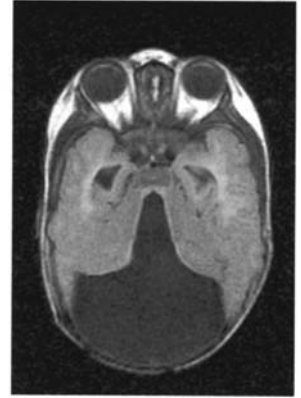
Septo-optic dysplasia



Absence of SP— **LOOK FOR SEPTO-OPTIC AND SCHIZENCEPHALY*

CYSTIC POSTERIOR FOSSA

DW Complex



DW Variant
MCM
Arachnoid Cyst

Cerebral Angiography

Angiograms shown in the Neuro section will be looking for specific diagnoses based on the region in which they are shown. These are:

ANGIOGRAPHIC DDX

AORTIC ARCH

Vessel Irregularity

Atherosclerosis



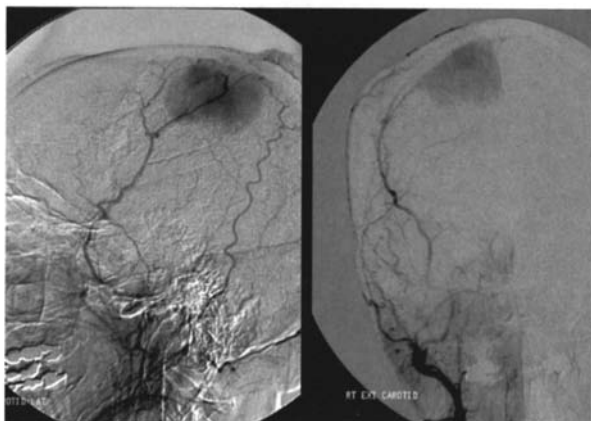
Vasculitis

Trauma

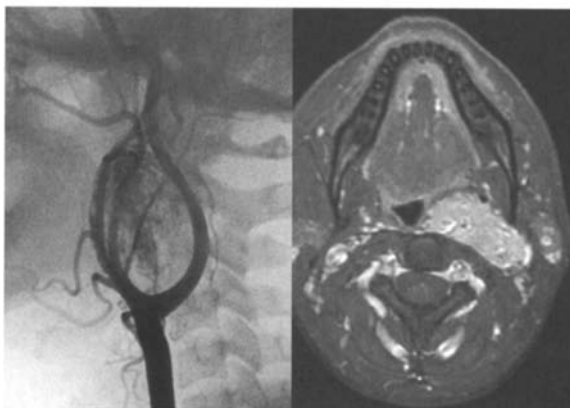
EXTERNAL CAROTID ARTERY

Tumor

- Meningioma
- Juvenile Angio



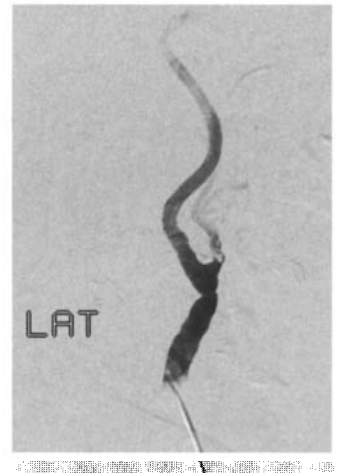
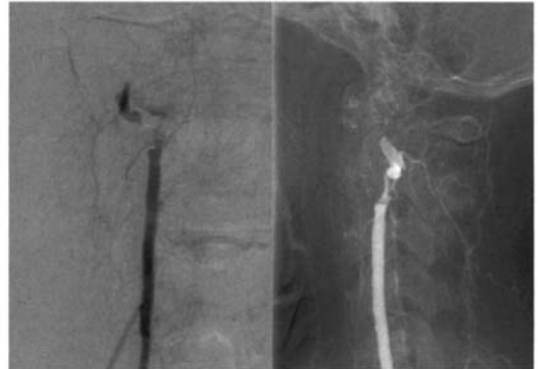
Chemodectoma



CERVICAL CCA/ICA/VERT

Vessel Irregularity

Atherosclerosis



FMD
Dissection
Trauma

Neoplasm

Paraganglioma

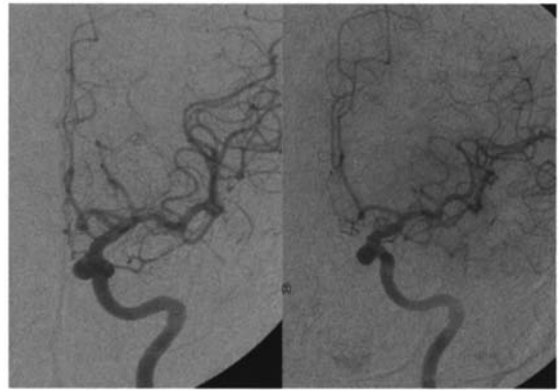
AVM—Dural-based**PETROUS INTERNAL CAROTID ARTERY**

Trauma

Aneurysm

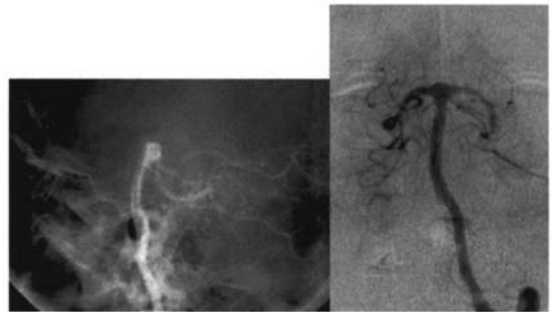
INTRACRANIAL ICA

- Aneurysm
- CCF
- Occlusion



CIRCLE OF WILLIS

- Aneurysm



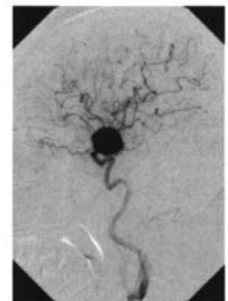
- AVM

- Stenosis

- Tumor

- Meningioma

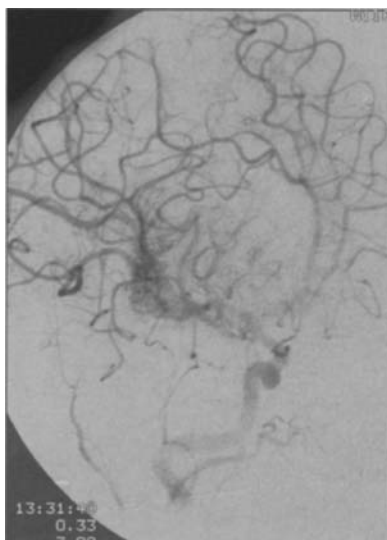
- Hemangioblastoma



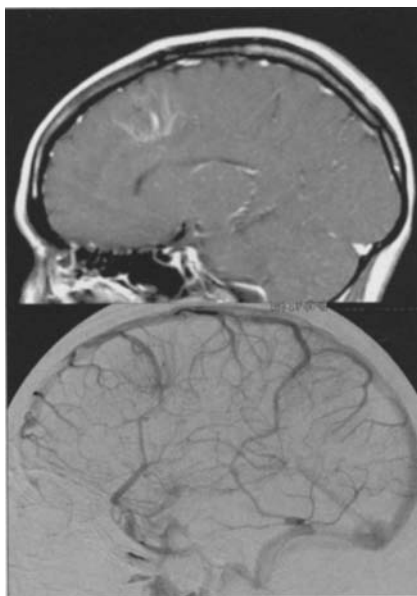
INTRACRANIAL

VASCULAR MALFORMATIONS

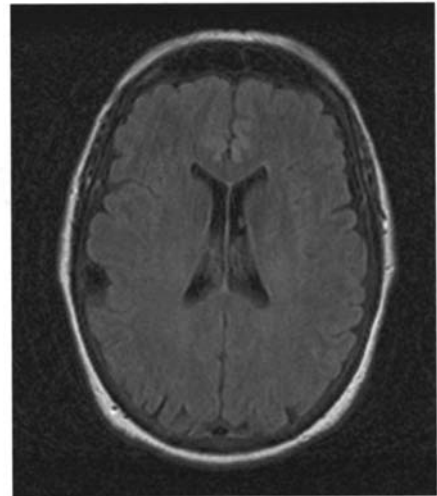
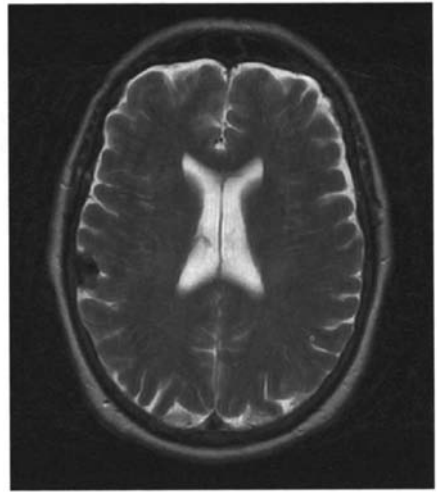
AVM—parenchymal/dural/cryptic



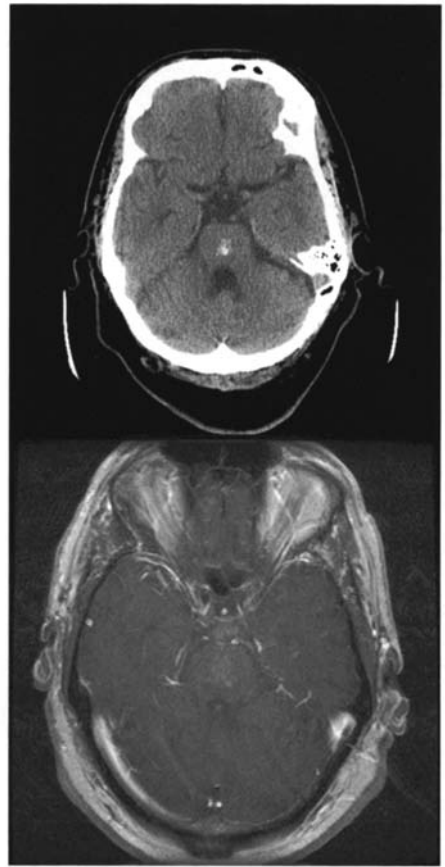
Venous angioma (deep venous anomaly)/cavernoma



Cavernous Angioma



Capillary Telangiectasia



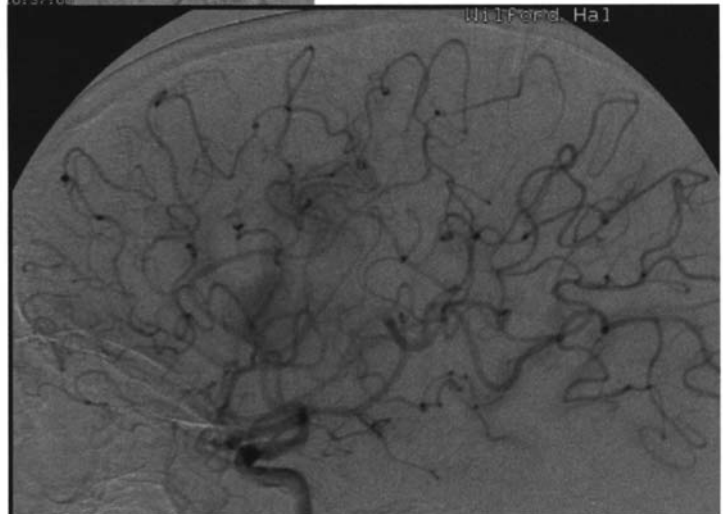
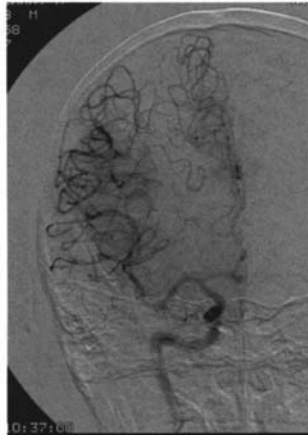
VASCULITIS

Infectious
TB
Syphilis

Noninfectious
Cocaine
Amphetamine

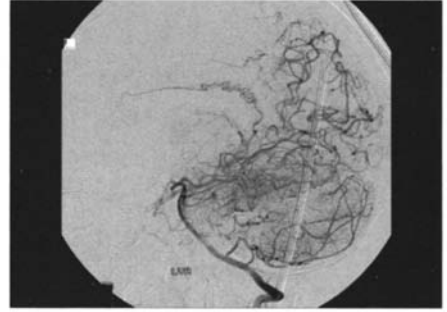
Atypical
Drug ergots

Nondrug
Sarcoid
Wegener's
PAN



CHILDREN/INFANTS

- Moya Moya
- NF
- Sickle
- Radiation
- Idiopathic
- Vein of Galen malformation



CSF SEEDING

PAGE ME

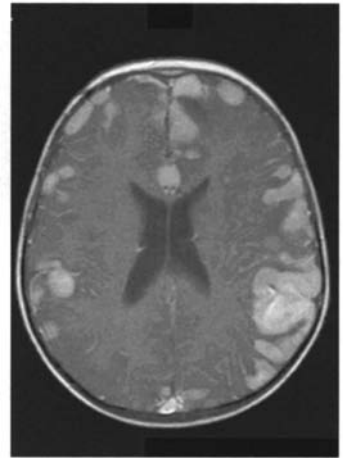
Papillomas—choroid plexus/carcinoma

Astrocytomas—GBM

Germinoma

Ependymoma

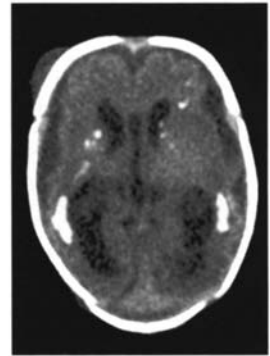
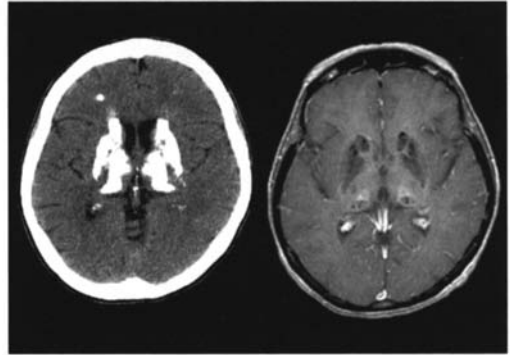
MEdulloblastoma



BASAL GANGLIA Ca^{2+} HYPERDENSE ON CT/HYPOINTENSE ON T1

BIRTH

Birth Anoxia
 Infection—HIV
 Radiation
 Toxin—Carbon Monoxide/Lead/TPN
 Hypoparathyroidism/Hypophosphatasia



BASAL GANGLIA DISEASES HYPODENSE ON CT/HYPERINTENSE ON T2

LINT

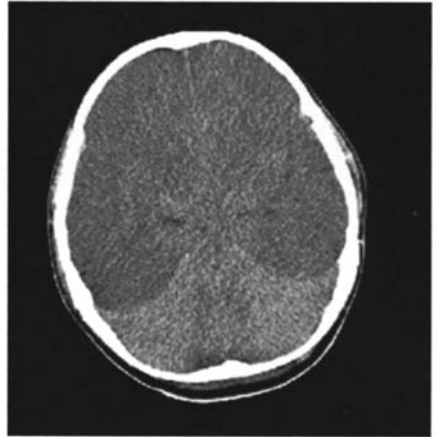
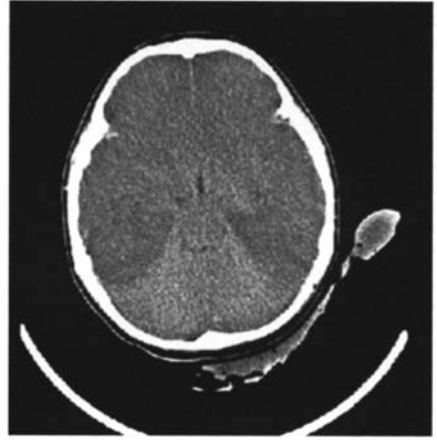
Lymphoma
 Infarction—hypoxia/hypotension
 Neurodegenerative—Wilson's
 Toxins—Carbon Monoxide/Cyanide/Choloroethane



DIFFUSE CEREBRAL EDEMA

HIGH PRESSURE

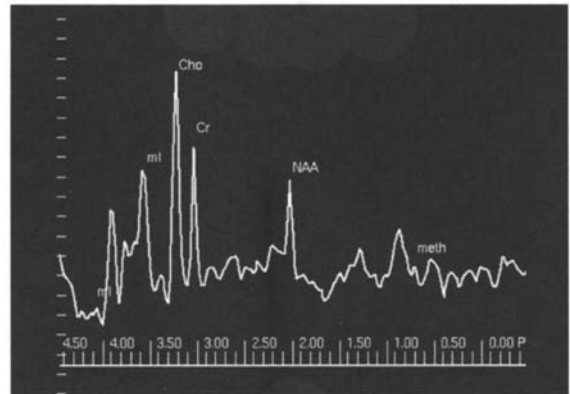
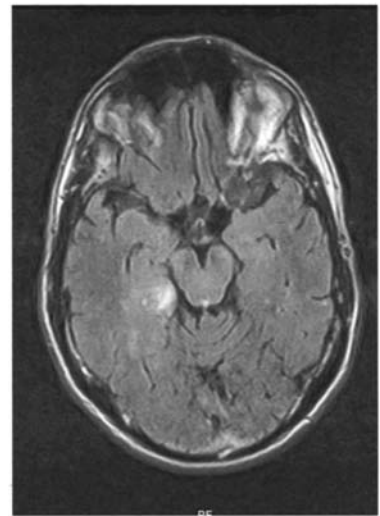
- Hypertensive crisis
- Pseudotumor
- Reye's syndrome
- Encephalitis
- Sagittal SinUs thRombosis
- Eclampsia



SPECTROSCOPY

Normal Spectrum

			X	
			X	
			X	
X	X		X	X
X	X		X	X
XXXXX	XXXXXXXXXXXX	XXXXXX	XXXXXXX	
Choline	Creatine	NAA	Lactate	



Rules of Thumb

1. Low grade tumor and demyelination can look identical.
2. Very high choline levels usually indicates tumor.
3. Infarct shows elevated lactate and decreased other values.
4. Increased lactate in the CSF can be seen in NPH.
5. Decreased NAA indicates neuronal loss (including neuronal loss seen in tumor).

Spine

INTRADURAL INTRAMEDULLARY

AHEM, MIGHT I help you?

- Astrocytoma
- Hemangioblastoma
- Ependymoma
- Mets

- MS
- Infection/myelitis
- Granulomatous – sarcoid
- Hemorrhage
- Trauma



INTRADURAL EXTRAMEDULLARY

DAMN VASCULAR HEMATOMA

- Dural mets
- AVM/arachnoid cyst
- Meningioma
- NF/Schwannoma

- Vascular
- Hematoma



EXTRADURAL EXTRAMEDULLARY

SMALL HEAD

Synovial cyst

Mets/Meningioma/Schwannoma

AVM

Lymphoma

Leukemia

Hematoma

Epidural Abscess

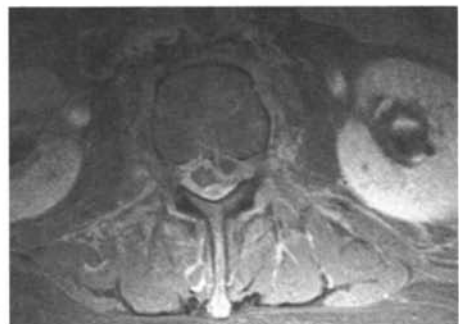
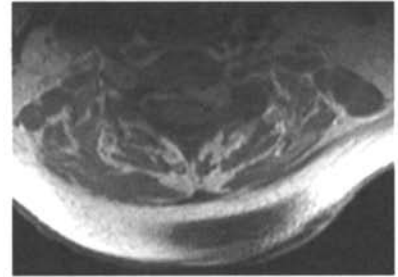
Adenopathy

Disk

Bulge

Herniation—Extrusion/Protrusion

Free Fragment



ARACHNOIDITIS

- Failed back syndrome
- Subarachnoid hemorrhage
- Infection
- Pantopaque

