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Diagnostic Imaging: Test Selection and Interpretation

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HOW TO USE THIS SECTION

Information in this chapter is arranged anatomically from superior to inferior. It would not be feasible to include all available diagnostic tests in one chapter in a book this size, but we have attempted to summarize the essential features of those examinations that are most frequently ordered in modern clinical practice or those that may be associated with difficulty or risk. Indications, advantages and disadvantages, contraindications, and patient preparation are presented. Costs of the studies are approximate and represent averages reported from several large medical centers.

\$ = < \$250
\$\$ = \$250–\$750
\$\$\$ = \$750–\$1000
\$\$\$\$ = > \$1000

Risks of Intravenous Contrast Studies

While intravenous contrast is an important tool in radiology, it is not without substantial risks. Minor reactions (nausea, vomiting, hives) occur in about 5% of patients. Major reactions (laryngeal edema, bronchospasm, cardiac arrest) occur in about 1:3000 patients. Patients with an allergic history (asthma, hay fever, allergy to foods or drugs) are at increased risk. A history of reaction to contrast material is associated with an increased risk of a subsequent severe reaction. Prophylactic measures that may be required in such cases include H₁ and H₂ blockers and corticosteroids.

In addition, there is a risk of contrast-induced renal failure, which is usually mild and reversible. Persons at increased risk for potentially *irreversible* renal damage include patients with preexisting renal disease (particularly diabetics with high serum creatinine concentrations), multiple myeloma, and severe hyperuricemia.

In summary, intravenous contrast should be viewed in the same manner as other medications—ie, risks and benefits must be balanced before an examination using this pharmaceutical is ordered.

Test	Indications	Advantages	Disadvantages/Contraindications	Preparation	
HEAD Computed tomography (CT) \$\$\$	Evaluation of acute craniofacial trauma, acute neurologic dysfunction (< 72 hours) from suspected intracranial or subarachnoid hemorrhage. Further characterization of intracranial masses identified by MRI (presence or absence of calcium or involvement of the bony calvarium). Evaluation of sinus disease and temporal bone disease.	Rapid acquisition makes it the modality of choice for trauma. Superb spatial resolution. Superior to MRI in detection of hemorrhage within the first 24–48 hours.	Artifacts from bone may interfere with detection of disease at the skull base and in the posterior fossa. Limited to transaxial views. Contraindications and risks: Contraindicated in pregnancy because of the potential harm of ionizing radiation to the fetus. Use of intravenous contrast agents is associated with infrequent but substantial risks (see p 241.)	Normal hydration. Sedation of agitated patients. Recent serum creatinine determination if intravenous contrast is to be used.	CT
HEAD Magnetic resonance imaging (MRI) \$\$\$\$	Evaluation of essentially all intracranial disease except those listed above for CT.	Provides exquisite spatial resolution, multiplanar capability. Can detect flowing blood and cryptic vascular malformations. Can detect demyelinating and dysmyelinating disease. No beam-hardening artifacts such as can be seen with CT. No ionizing radiation.	Subject to motion artifacts. Inferior to CT in the setting of acute trauma because it is insensitive to acute hemorrhage, incompatible with life support and traction devices, inferior in detection of bony injury and foreign bodies, and requires longer imaging acquisition time. Contraindications and risks: Contraindicated in patients with cardiac pacemakers, intraocular metallic foreign bodies, intracranial aneurysm clips, cochlear implants, some artificial heart valves, and life support devices.	Sedation of agitated patients. Screening CT of the orbits if history suggests possible metallic foreign body in the eye.	HEAD MRI



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Test	Indications	Advantages	Disadvantages/Contraindications	Preparation	
BRAIN Brain scan (radio-nuclide) \$\$	Establishment of brain death. Evaluation of suspected herpes simplex encephalitis, dementia, seizures. Single photon emission computed tomography (SPECT) imaging can be used to distinguish ischemia from infarct.	Provides functional information. Can be portable.	Limited resolution. Delayed imaging (1–4 hours) often required. Contraindications and risks: Caution in pregnancy because of the potential harm of ionizing radiation to the fetus.	Sedation of agitated patients. Premedicate with potassium perchlorate when using TcO ₄ in order to block choroid plexus uptake.	Radionuclide scan
BRAIN Cisternography (radio-nuclide) \$\$	Evaluation of hydrocephalus (particularly normal pressure), CSF rhinorrhea or otorrhea, and ventricular shunt patency.	Provides functional information. Can help distinguish normal pressure hydrocephalus from senile atrophy. Can detect CSF leaks.	Requires multiple delayed imaging sessions up to 48–72 hours after injection. Contraindications and risks: Caution in pregnancy because of the potential harm of ionizing radiation to the fetus.	Sedation of agitated patients. For suspected CSF leak, pack the patient's nose or ears with cotton pledgets prior to administration of dose. Must follow strict sterile precautions for intrathecal injection.	BRAIN Cisternography