

## The XRay Department/Diagnostic Imaging-1

Most patients are familiar with visiting their physician with symptoms and being told that they need a test to help in making a diagnosis, or planning treatment.

Frequently these are radiological tests. Since Roentgen discovered Xrays over 100 years ago the process of “seeing “inside the body has evolved.

The radiological tests are carried out at the “Xray” Department or Department of Diagnostic Imaging in a Hospital, or at a Private Radiology Clinic.

It is not possible to describe all the possible tests and indications, but will be summarised in two sections. First as descriptions of the tests, and in a second article deal with screening, and also the role of the Radiologist.

The tests include X-ray radiographs or “films”, Barium Studies (stomach, small bowel, colon examinations), Ultrasound, Nuclear Medicine Studies, C.A.T. (Computerised Axial Tomography) ,M.R.I. (Magnetic Resonance Imaging) and Angiography.

Plain X-rays generally require no preparation.

Some studies, such as Barium Studies of the stomach, small bowel or colon need the patient to prepare prior to the test. This may mean not eating before the test, or taking a laxative to ensure that material in the bowel does not obscure details.

These show ulcers, tumours and inflammatory conditions.

Ultrasound uses sound waves to give a picture of the body and is frequently used to image the fetus during pregnancy where X-rays could be harmful.

For pelvic Ultrasound a full bladder is needed as a “window” to see through.

Other uses of Ultrasound include imaging of the abdomen, breast, thyroid, uterus, ovaries, testes and prostate. Doppler ultrasound allows visualization of the blood vessels, obstructions, and flow abnormalities inside them.

Some tests need addition of medications such as barium or contrast medium, either orally or by injection, to increase the differences between the tissues and let the doctor viewing the study see and learn more.

All medications have some risk of complications- including those specific to the individual patient such as allergy. These risks are discussed with the patient prior to the test.

Diagnostic Imaging Departments and Private Clinics have information leaflets and instructions to give patients before their test.

Nuclear Medicine studies involve injecting the patient with a very small amount of a radioactive substance which attaches to a particular body tissue or organ which is then imaged by scanning or counting the radioactivity. The radioactive dose is very small and passes out of the patient ‘s body within hours. Some examples of these studies are imaging of bone disease, including tumours, density of bone or osteoporosis, and heart

disease and function. Lung scans for detection of pulmonary emboli or clots are also carried out.

C.T. or Cat Scans, use a thin beam of X-rays which is scanned through the patient. The information is then assembled by computer into an anatomic picture of the patient and their organs. These are useful in diagnosing emergency cases of intracranial bleeding, stroke, trauma to the head and body, ruptured aneurysm, and inflammation such as diverticulitis and appendicitis.

This technique is used extensively in diagnosing and the management of malignancy and its spread.

M.R.I uses both stationary and moving magnetic fields to construct an image which is similar to a CAT scan but shows the soft tissues more clearly. It has particular use in neurology and soft tissue injury and disease. It has a use in children where X-ray irradiation may be undesirable.

Angiography involves puncturing a peripheral vessel, usually an artery, and introducing a flexible wire. This is manipulated under X-ray, or fluoroscopic guidance to a specific site. A catheter or tube is passed over the wire and contrast medium, or X-ray dye injected. The catheter can be manipulated into smaller vessels within an individual organ to image the blood vessels locally or within a tumour. Therapeutic measures of dilating a narrowed vessel with a small balloon on a catheter (angioplasty), or introducing material to block the blood supply of a malignant tumour or benign fibroid to reduce their size is also possible.

In the next article Screening tests, or tests of patients without symptoms, will be covered, together with the Radiologist or specialist who interprets the results.

## The X-ray Department/Diagnostic Imaging-2

Screening, or tests of patients without symptoms, is also a feature of Diagnostic Imaging. In Mammography, low dose x-ray images of the breast are obtained to diagnose malignancy at an early stage. Locally this is performed in Hospitals, at the Ontario Breast Screening Program and in private Radiology Clinics.

Further mammography or ultrasound guided procedures include investigation of breast lesions, breast biopsy and localization of non-palpable breast masses prior to surgery.

Recently, screening body CAT scans of patients without symptoms have been offered by facilities, mostly out with Canada. Unfortunately these scans show a rate of up to 70% findings. These consist of a variety of lesions such as renal, liver, ovarian cysts and very small lung nodules. The vast majority of these is of no significance to the patient's health

and generate anxiety in the patient. Also these lead to further costly testing and follow-up procedures.

There are currently studies underway to evaluate CAT screening of asymptomatic patients with a family history of a disease, or within a high risk group such as smokers. The results of these studies and whether early detection leads to better health and longer survival are still being evaluated.

Screening CAT scans in asymptomatic patients without family history of a disease are not recommended by the Canadian Association of Radiologists or American College of Radiology.

With such a wide range of techniques, a specially trained Physician is required to read or interpret the results of all these Tests. These are Radiologists, or in the case of Nuclear Medicine Studies, a Nuclear Medicine Physician.

Radiologists are Physicians who have undergone further 3-4years training and passed specialty examinations in Diagnostic Imaging .They may have additional training in special fields like Ultrasound or C.T.

They consult with your Physician to advise the best test, and interpret the results. As Diagnostic Radiologists they both diagnose disease and recommend management.

Interventional Radiologists interpret the results and also carry out biopsies of masses, or lumps shown on these images. They carry out drainages of abscesses, or tube insertions to by pass obstructions with the images as guides. Most interventional procedures are carried out in Hospitals either as Out-patients or In-patients. This may prevent the patient requiring Surgery or decrease the length of stay in hospital.

Radiologists are at the forefront of advances in communication and transfer of images.

With the use of picture archiving or PACS, there is digitalization of images and computer storage on “hard drive”.Traditional.X-ray film is slowly disappearing from use. Currently at Windsor Regional Hospital all C.T., Ultrasound and Nuclear Medicine Images are being stored in this way.

The Radiologist can access the images from off-site, out of normal hours, via a secure Web link. This allows Emergency cases to be viewed and reported to the Emergency Department without delay.

Patients who require taking their images to another Specialist can be given them on CD – viewable on most standard computers.

As with all tests the Radiologist and Staff of the Department of Diagnostic Imaging realize the anxiety that awaiting the result of a procedure causes.

A typical Community Hospital may carry out over 80 Ultrasound and 50 C.T. scans alone per day. The number of plain X-ray examinations and other studies are much greater...

Sometimes there is a delay while previous studies are obtained for comparison, or further information or opinion sought from another Physician.

Every attempt is made to send the result to your Physician promptly.

With current shortages of funding and personnel in Health Care, delays in arranging tests exist, particularly in access to C.T. and M.R.I.This equipment is not only expensive to purchase exceeding \$1million per machine, but expensive to run at \$500,000 per year.

Both individually and through their professional associations Radiologists are also advocates for their patients- informing, advising and encouraging Hospitals, Local and National Government to update, improve and replace equipment and services.

Further information can be obtained at the Ontario Association of Radiologists website <http://www.oar.info>

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