ADVANCED BIO MEDICAL INSTRUMENTATION

LECTURE 05: SURGICAL SCOPY AND DIATHERMY EQUIPMENTS

BONE DENSITOMETRY

Bone densitometry is a test like an X-ray that quickly and accurately measures the density of bone. It is used primarily to detect osteopenia or osteoporosis, diseases in which the bone's mineral and density are low and the risk of fractures is increased. Bone density scanning, is also called dual-energy x-ray absorptiometry (DXA).

DXA is most often performed on the lower spine and hips. In children and some adults, the whole body is sometimes scanned.

DXA is most often used to diagnose osteoporosis, a condition that often affects women after menopause but may also be found in men and rarely in children. Osteoporosis involves a gradual loss of calcium, as well as structural changes, causing the bones to become thinner, more fragile and more likely to break.

DXA is also effective in tracking the effects of treatment for osteoporosis and other conditions that cause bone loss. The DXA test can also assess an individual's risk for developing fractures. The risk of fracture is affected by age, body weight, history of prior fracture, family history of osteoporotic fractures and life style issues such as cigarette smoking and excessive alcohol consumption. These factors are taken into consideration when deciding if a patient needs therapy.

The DXA machine sends a thin, invisible beam of low-dose x-rays with two distinct energy peaks through the bones being examined. One peak is absorbed mainly by soft tissue and the other by bone. The soft tissue amount can be subtracted from the total and what remains is a patient's bone mineral density.

DXA machines feature special software that compute and display the bone density measurements on a computer monitor.

ENDOSCOPY

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Endoscopy is a nonsurgical procedure used to examine a person's digestive tract.

An endoscope is a long, thin, flexible tube that has a light source and a video camera at one end. Images of the inside of your body are relayed to a television screen. Endoscopes can be inserted into the body through a natural opening, such as the mouth and down the throat, or through the anus (via the bottom).

Alternatively, an endoscope can be inserted through a small surgical cut made in the skin (known as keyhole surgery).

There are many different types of endoscope, and depending on the site in the body and the type of procedure, endoscopy may be performed by a doctor or a surgeon, and the patient may be fully conscious or anaesthetised.

Type of endoscope	**Put in through**	**Body part or area(s) looked at**	**Name(s) of procedure**
Arthroscope	Cuts in the skin	Joints	Arthroscopy
Bronchoscope	Mouth or nose	Trachea (windpipe) and bronchi (tubes going to the lungs)	Bronchoscopy, flexible bronchoscopy
Colonoscope	Anus	Colon and large intestine	Colonoscopy, lower endoscopy
Cystoscope	Urethra	Bladder	Cystoscopy, cystourethroscopy

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Type of endoscope	Put in through	Body part or area(s) looked at	Name(s) of procedure
Enteroscope	Mouth or anus	Small intestine	Enteroscopy
Laparoscope	Cut(s) in the abdomen (belly)	Space inside abdomen and pelvis	Laparoscopy, peritoneal endoscopy
Laryngoscope	Mouth or nose	Larynx (voice box)	Laryngoscopy

LAPAROSCOPY

Laparoscopy is a type of surgical procedure that allows a surgeon to access the inside of the abdomen and pelvis without having to make large incisions in the skin. Large incisions can be avoided during laparoscopy because the surgeon uses an instrument called a laparoscope. This is a small tube that has a light source and a camera, which relays images of the inside of the abdomen or pelvis to a television monitor.

The advantages of this technique over traditional open surgery include:

1. a shorter hospital stay and faster recovery time
2. less pain and bleeding after the operation
3. reduced scarring

Laparoscopy is used to find problems such as cysts, adhesions, fibroids and infection. Tissue samples can be taken for biopsy through the tube (laparoscope).

There are two types of laparoscope: (1) a telescopic rod lens system, that is usually connected to a video camera (single chip or three chip), or (2) a digital laparoscope where the charge-coupled device is placed at the end of the laparoscope.

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Procedure

Laparoscopy is carried out under general anesthesia. During laparoscopy, the surgeon makes one or more small incisions in the abdomen. These allow the surgeon to insert the laparoscope, small surgical tools and a tube, which is used to pump gas(carbon di oxide) into the abdomen – this makes it easier for the surgeon to look around and operate. After the procedure, the gas is let out of your abdomen, the incisions are closed using stitches and a dressing is applied.

BRONCHOSCOPY

Bronchoscopy is a procedure during in which an examiner uses a viewing tube to evaluate a patient's lung and airways including the voice box and vocal cord, trachea, and many branches of bronchi. Bronchoscopy is usually performed by a pulmonologist or a thoracic surgeon.

There are two types of bronchoscopes - a flexible fiberoptic bronchoscope and a rigid bronchoscope. A flexible scope is almost always used. It is a tube less than 1/2-inch wide and about 2 feet long. In rare cases, a rigid bronchoscope is used.

Procedure

Medicines are passed through a vein (intravenously) to help a person relax. Or asleep under general anesthesia, especially if a rigid scope is used.A numbing drug (anesthetic) will be sprayed in the mouth and throat. If bronchoscopy is done through the nose, numbing jelly will be placed in one nostril. The scope is gently inserted. It makes the person cough at first. The coughing will stop as the numbing drug begins to work. The doctor may send saline solution through the tube. This washes the lungs and allows the doctor to collect samples of lung cells, fluids, and other materials inside the air sacs. This part of the procedure is called a lavage. Sometimes, tiny brushes, needles, or forceps may be passed through the bronchoscope to take very small tissue samples (biopsies) from your lungs.

GASTROSCOPY

Gastroscopy is an examination of the inside of the gullet, stomach and duodenum. It is performed by using a thin, flexible fibre-optic instrument that is passed through the mouth and allows the doctor to see whether there is any damage to the lining of the oesophagus (gullet) or stomach, and whether there are any ulcers in the stomach or duodenum.

The endoscope has a light and a camera at one end. The camera sends images of the inside of your oesophagus, stomach and duodenum to a monitor.

Procedure

After explaining the procedure, the endoscopist will spray the back of the throat with a local anaesthetic.

When sedation is used, it is not a full anaesthetic and the patient will still be conscious and aware. A nurse will lie the patient on their left side and the endoscopist will then gently place the end of the instrument into the mouth and ask the patient to swallow it, which feels like swallowing a large piece of food. The endoscopist may need to put some air into the stomach to perform the examination effectively and this can cause discomfort or even a need to belch. This is perfectly normal. The endoscopist will closely examine the lining of the gullet, stomach and duodenum to identify the cause of the symptoms. It will take about 10 to 15 minutes.