

## SPECIAL RADIOLOGICAL INVESTIGATIONS

### Unit-1: Contrast Media

Introduction: Special Radiological Investigations are done to evaluate the systems of the body using special kind of chemical agent called contrast media for better evaluation/diagnosis of the diseases

Contrast Media: It is a chemical agent which is introduced into the body cavities or hollow organs to enhance the visibility of the part.

Classification : Broadly contrast media can be classified into positive and negative contrast media. Positive contrast media are having high atomic no. and appears white on the image whereas negative contrast media have very low atomic no. and due to less interaction with X-ray photons they appear black on the image

Positive contrast media can be further divided as Barium Sulphate, Oil Based Contrast Media and Water Soluble Contrast Media. Now a days mostly water soluble contrast media are used. These can be subdivided into High Osmolar Contrast Media (HOCM) and Low Osmolar Contrast Media (LOCM). HOCM are less stable and may cause reaction in prone patients. LOCM is much safer for all categories of patients

Mode of Administration of Contrast Media

1. Oral Route
2. Intravenous Route
3. Intra Thecal Route
4. Intra Vaginal Route

Reactions of Contrast Media: Contrast Media is a potentially hazardous drug and always carry the risk of reaction. Some of the patients; depending on age, sex and medical condition may be more prone to these reactions. Based on intensity, these reactions can be classified as:

- a. Mild reactions-These reactions are most common among the patients. These reactions are self recoverable and does not require any medication. These reactions include sneezing, headache, chilling, sensation of heat, nausea & vomiting.
- b. Moderate reactions: These include allergy, urticaria, convulsions, dyspnoea etc. Needs immediate medical care. However, these reactions are completely recoverable and instant medical care is helpful
- c. Severe Reactions: These reactions are rare and occur in .0001 cases. It include cardiac, arrest, respiratory arrest and failure of other vital organs. It can cause death as the time of response in these cases is very less

## UNIT 2- INTRAVENOUS PYELOGRAPHY

**INTRODUCTION:** It is a special radiological investigation done to evaluate the urinary system with the help of intravenous injection of a positive contrast media

### CLINICAL INDICATION:

- a. To assess the size, shape and location of the kidneys
- b. To check the Renal Functions
- c. Urinary Tract Calculi
- d. Hydronephrosis
- e. Prior to renal implantation
- f. To assess hypertension
- g. Hematuria
- h. Abdominal mass having its origin from kidney

### CONTRAINDICATIONS:

- a. Pregnancy
- b. Multiple Myeloma
- c. Diabetes Mellitus
- d. Infants
- e. Patients with known history of Contrast Media reactions
- f. Diseases of vital organs viz. cardiac, respiratory or liver diseases

### PATIENT PREPARATION:

- a. 6-8 hours Oral Fasting on the day of examination
- b. Two tablets of Dulcolax and four tablets of Charcoal on the previous evening followed by low residual diet
- c. Low residual diet like cereals, pulses, chapatti etc. Spinach, beans, peas, milk etc. to be avoided
- d. Patient should avoid heavy metal containing tablets like iron and zinc containing tablets, multivitamins etc. on the previous evening of the examination
- e. No smoking on the day of examination as it would increase the gastric motility
- f. Patient should get his Serum Creatinine and Blood Urea test done before the procedure
- g. ECG of the patient should be within normal limits

**CONTRAST MEDIA:** Low Osmolar water soluble contrast media like omnipaque 76% should be used in 40ml volume or 1ml/kg body weight in bolus form. Pre-warming of Contrast Media decreases the risk of renal spasm

### ACCESSORIES AND EQUIPMENTS:

- a. Scalp Vein Set
- b. Butterfly Needle, Adhesive tape, Arm Pad
- c. Mother tincture, spirited swab, tourniquette, cotton, 20ml syringes with needle

- d. Contrast Media
- e. Emergency Drugs

**PLAIN FILM:** Plain KUB should be taken on 14" X 17" sized film to include the complete urinary tract. This film is useful to diagnose the followings:

- a. To assess the bowel preparation of the patient
- b. To show any renal calculi or abdominal mass on the film
- c. To assess the position
- d. To assess the exposure factors

**SPECIAL TECHNIQUE AND FILMING:** All the diagnostic test reports should be checked and if satisfactory we should move for the procedure. All metallic objects from the area of interest of the patient should be removed and patient should change into hospital gown. A tourniquette should be applied on the upper arm of the patient just behind the elbow and scalp vein set should be fixed in position.

20ml contrast loaded syringe should be taken and about 2ml of contrast media is injected as test dose. If no reaction of the contrast media appears, complete dose of 20ml should be injected in bolus form followed by another syringe of 20 ml contrast media. After 60 seconds of injection of the contrast media, first film should be taken.

**FILMING:**

- a. 0 Min. film or Nephrogram: This film is taken before 1 min of injection of contrast media. The purpose of this film is to assess the size, shape, location and outer margin of the kidney and hence the film is also called Nephrogram. This is taken on 10" x 12" sized film to include only the bilateral kidneys
- b. 5 Min film: This film is taken after 5 mins. Of injection of the contrast media. It is taken to see the symmetrical renal function of both the kidneys and also to assess any Hydronephrosis. This film is also taken 10" x 12" sized film to include only the bilateral kidneys.

After taking the 5 min film, compression band is applied over the flank area so as to retain the contrast media in the Pelvi-calyceal System (PCS) of the Kidney and see the dilation of PCS. However, compression band is contraindicated in following cases:

1. Old aged patients as they would feel difficulty in breathing due to compression band
2. Patients having abdominal mass
3. Patients with hematuria
4. Patients who have recently undergone any abdominal surgeries
5. When the Pelvicalyceal System is already dilated on 5 min film

After applying compression device, 15 min film is taken

3. 15 Min film: This film is taken on 10" x 12" film to include the bilateral kidneys. This film helps to visualize the dilation of the Pelvi-calyceal System and diagnose any Hydronephrosis

After 15 min film, the compression device is removed and a release film is taken at 20 min

4. Release film: This film is taken on 12" x 15" to see the flow of contrast media through the ureters and also to check any ureteric calculi or obstruction

5. Full Bladder film: This film is taken on 10" x 12" film to include the complete Urinary Bladder. Purpose of this film is to see whether the walls of the Urinary Bladder dilate normally or not when the contrast media enters into the Urinary Bladder from the Ureters. This film is taken after 30-40mins of injecting the contrast media

6. Post void or Micturition Film: After the full bladder or pre-void film, the patient is asked to micturate and film of the Urinary Bladder area is taken on 10" x 12" sized film. The purpose of this film is to assess the normal return of the Urinal Walls to their natural position after urination and to see the residual volume of the Contrast Media. It is generally taken on 10" x 12" sized film but if any symptoms of Vesico-ureteric Reflux are noticed, complete KUB film should be taken on 14"x 17" sized cassette

According to requirement, sometimes, Posterior oblique films, delayed films, prone films are also taken for better diagnosis

#### **COMPLICATIONS:**

- a. Introduction to infection if aseptic conditions are not followed
- b. Pain, swelling, thrombosis while doing the venipuncture
- c. Possibilities of general contrast media reactions

#### **AFTERCARE:**

- a. Advice the patient to take plenty of oral fluid for early elimination of the contrast media through urine
- b. Provide mild analgesic to the patient if required
- c. Record the vital signs of the patient
- d. Observe the patient for 1 hr, discharge if no complications are noted

### UNIT 3: MICTURITING CYSTOURETHROGRAPHY (MCU)

**INTRODUCTION:** It is a special radiological investigation to evaluate the Urethra with the help of a positive contrast media introduced into the Urinary Bladder and taking films while the patient micturating

#### INDICATIONS:

- a. Vesico-Ureteric Reflux
- b. Stress Incontinence
- c. Bladder abnormalities
- d. Urethral fistula and diverticula
- e. Urethral calculi

#### CONTRAINDICATIONS:

- a. Acute Urinary Tract Infection
- b. Local Septicemia
- c. Known history of severe contrast media reaction

**PATIENT PREPARATION:** Patient should remove all the metallic objects from the area of interest and change into hospital gown

#### ACCESSORIES AND EQUIPMENTS:

- a. Fluoroscopic unit with spot film device and tilting table facility
- b. Foley's Catheter
- c. Xylocaine Jelly, normal saline, mackintosh towel
- d. Spiritted swab, betadine
- e. 10 and 20ml syringes with needle
- f. Contrast Media and emergency drugs

**CONTRAST MEDIA:** HOCM or LOCM in about 40 ml volume diluted with water Pre-warming of contrast media is useful to prevent urinary spasm

**PLAIN FILM:** Plain AP view of Urinary Bladder on 10" x 12" sized film is taken to assess any bladder mass or urethral calculi

**SPECIAL TECHNIQUE AND FILMING:** Patient comes to the X-ray department with necessary preparation and after changing into hospital gown lies down supine on the X-ray table. Urethra of the patient is thoroughly cleaned and foley's catheter lubricated with Xylocaine 2% Jelly is introduced into the urethra.

Balloons of the catheter are inflated by injecting about 2 ml normal saline. 20ml contrast loaded syringe is connected with the outer end of the catheter and contrast media is slowly injected into the Urinary

bladder. Contrast media should be injected till patient feels fullness in the loin but should be immediately terminated if he feels severe urethral pain or hematuria occurs. When patient feels urinal pressure, foley's catheter is slowly removed and then patient is asked to micturate in Right Posterior Oblique (RAO) position on an absorbent pad or urinary tray. Toddlers or young children will find it easier to micturate using a hot bath and patients with Neuropathic bladder can be helped to micturate by applying pubic pressure.

Films are taken both in Right Posterior Oblique Position and Left Posterior Oblique (LPO) Position using under couch tube as soon as urine droplet appears on the tip of the urethra.

**COMPLICATIONS:**

- a. Possibility of introduction to Urinary Tract Infection if aseptic conditions are not followed
- b. Pain and hematuria during insertion of Foley's catheter
- c. Dysuria after the procedure is over
- d. Possibility of general reactions of Contrast Media

**AFTERCARE:**

- a. Instruct the patient to consume plenty of oral fluid/water after the procedure
- b. Provide mild analgesic in case of pain
- c. Clean the urethra with betadine solution to avoid any possibility of Urethral Infection

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#### UNIT 4: RETROGRADE PYELOURETEROGRAPHY

**INTRODUCTION:** It is a special radiological investigation used to evaluate the Ureters using retrograde injection of a positive contrast media into the ureters

#### CLINICAL INDICATIONS:

- a. Incomplete or unsatisfactory results of IVP
- b. Patients who can not take intravenous injection of Contrast Media due to known history of reactions
- c. Obstructive pathology of ureters like ureteric calculi, ureteric lesions etc.
- d. Ureteric fistula and diverticula

#### CONTRAINDICATIONS:

- a. Abnormal bleeding and clotting time

Patient Preparation: As per surgical procedure

#### ACCESSORIES AND EQUIPMENTS:

- a. Fluoroscopic unit with spot film device and under couch tube
- b. Baby feeding tube or a fine catheter
- c. Xylocaine 2% jelly
- d. 10 ml syringe with needle
- e. Cotton, spirited swab, benzoid tincture

**CONTRAST MEDIA:** Preferably LOCM like Hypaque 76% in 10ml volume. Pre-warming of contrast media reduces the possibility of spasm

**SPECIAL TECHNIQUE AND FILMING:** It is a joint procedure carried out partially in the Operation Theater and partly in Radiology department. Surgeon will introduce the catheter into the urinary bladder under the effect of a Cystoscope using aseptic conditions and standard surgical procedures. Catheter is moved up to the upper third part of the Ureter.

Patient then comes to the radiology department with catheter in situ. Patient will lie supine on the X-ray table with mid sagittal plane coinciding with the mid table line. About 2 ml contrast media is injected with catheter in place and Oblique films are taken using the under couch tube. Injection of contrast media should be terminated if the patient complains of loin pain as it could be due to obstruction of the path of the contrast media due to ureteric calculi. Now the catheter is dragged down firstly 10 cm below and then up to last one third part and finally up to the tip of the Ureter. 2ml contrast media is injected at each junction and oblique films as previous are taken. Catheter is then removed by the surgeon in the Operation Theater

**COMPLICATIONS:**

- a. General complications of surgery
- b. Possibility of ureteric rupture while inserting the catheter
- c. Pain while inserting the catheter
- d. Introduction to Urinary Tract Infection if aseptic conditions are not followed

**AFTER CARE:**

- a. Advise the patient to take plenty of oral fluid
- b. Mild analgesic in case of pain
- c. Seal the puncture site with benzoid tincture



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