“ ЗАТВЕРДЖЕНО”

на методичній нараді кафедри

дитячої хірургії протокол № 1

від «08» лютого 2017 року

Зав. кафедрою дитячої хірургії

професор \_\_\_\_\_\_\_\_\_\_\_\_\_А.Ф. Левицький

LIST OF PRACTICAL SKILLS

FOR 5TH AND 6TH YEAR STUDENTS

|  |  |  |
| --- | --- | --- |
| **No** | **Name of skill** | **OSCEs station** |
| 1 | Hernia examination | Station 24 |
| 2 | Nasogastric intubation | Station 25 |
| 3 | Neonatal examination | Station 60 |
| 4 | Infant and child Basic Life Support | Station 66 |
| 5 | Wound suturing | Station 103 |
| 6 | Blood test interpretation | Station 106 |
| 7 | Chest X-ray interpretation | Station 109 |
| 8 | Abdominal X-ray interpretation | Station 110 |

**ALGORITHM OF PRACTICAL SKILL No 1 (OSCES STATION 24)**

**Hernia examination**

**Inguinal anatomy**

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| **Figure 1.** The inguinal canal runs along the inguinal ligament, from the internal (deep) ring to the external (superficial) ring. The inguinal ligament stretches from the anterior superior iliac spine to the pubic tubercle. The internal ring lies approximately 1.5 cm superior to the femoral pulse, itself in the midline of the inguinal ligament. The external ring lies immediately superior and medial to the pubic tubercle. NAVY: Nerve, Artery, Vein, Y-fronts. |

**Definition of a hernia**

A hernia is defined as the protrusion of an organ or part thereof through a deficiency in the wall of the cavity in which it is contained. There are many different types of hernia but the ones that are most likely to be examined are indirect and direct inguinal hernias and femoral hernias. Their principal differentiating features are summarised in *Table 1*. The differential diagnosis of a lump in the groin is listed in *Table 2*.

|  |  |  |
| --- | --- | --- |
| **Table 1. Principal differentiating features of indirect and direct inguinal and femoral hernias** | | |
| **Indirect hernia (through inguinal canal)** | **Direct hernia (through Hesselbach’s triangle)** | **Femoral hernia (below inguinal ligament)** |
| * Neck of hernia is superior to the inguinal ligament/pubic tubercle and lateral to the inferior epigastric vessels. * Accounts for 80% of inguinal hernias. * Irreducible. * Can strangulate. | * Neck of hernia is superior to the inguinal ligament/ pubic tubercle and medial to the inferior epigastric vessels. * Accounts for 20% of inguinal hernias. * Easily reducible. * Rarely strangulates. | * Neck of hernia is inferior and lateral to the inguinal ligament pubic tubercle. * Higher incidence in females, but still less common overall. * Often irreducible. * Frequently strangulates. |

|  |  |
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| **Table 2. Differential diagnosis of a lump in the groin** | |
| **Superior to the inguinal ligament** | **Inferior to the inguinal ligament** |
| * Indirect or direct inguinal hernia. * Incisional hernia. * Sebaceous cyst. * Lipoma. * Undescended testis. | * Femoral hernia. * Lymph node. * Sebaceous cyst. * Lipoma. * Saphena varix. * Femoral artery aneurysm. * Psoas abscess (rare). * Undescended testis. * Scrotal mass (see *Station 27*). |

**Before starting**

* + - Introduce yourself to the patient.
    - Explain the examination and obtain consent.
    - Ask for a chaperone.
    - Ask the patient to lie on the couch and to expose his abdomen from the umbilicus to the knees.
    - Ensure that he is comfortable.
    - Warm up your hands.

 *Ensure the patient’s dignity at all times.*

**The examination**

**Inspection and palpation**

* + - Inspect the groins (both sides!) for an obvious lump. If a lump is visible, determine its location in relation to its surrounding anatomical landmarks. Also determine its size, shape, colour, consist­ ency, and mobility. Is it tender to touch? Can it be transilluminated? (See *Station 9: Examination of a superficial mass and of lymph nodes*.)
    - Look for old surgical scars (incisional hernia).
    - Ask the patient to stand up and look again.

**Cough impulse and cough tests**

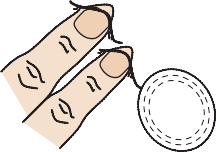
(The patient is still standing.)

* + - Ask the patient to cough and look again.
    - Test the lump for a cough impulse. Place two fingers over the lump and ask the patient to cough once more.
    - If you are satisfied that the lump is an inguinal hernia, ask the patient to reduce the lump. Once the lump is fully reduced, place two fingers over the internal ring and ask the patient to cough.
* if the lump does not reappear it is an indirect inguinal hernia. Release your fingers and ask the patient to cough again
* if the lump reappears medially it is a direct inguinal hernia
  + - Once again ask the patient to reduce the lump. This time place two fingers over the *external*

ring and ask the patient to cough.

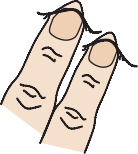
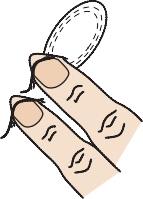
* if the lump does not reappear it is a direct inguinal hernia. Release your fingers and ask the patient to cough again
* if the lump reappears laterally it is an indirect inguinal hernia
  + - * Percuss the lump for resonance (bowel involvement).
      * Auscultate the lump for bowel sounds (bowel involvement).

1. (B)



Direct hernia

Indirect hernia



Direct hernia

Indirect hernia

**Figure 19.** The cough test with two fingers over the internal ring (A) and then over the external ring (B).

**After the examination**

* + Indicate that you would also examine the femoral pulses, inguinal lymph nodes, and scrotum.
  + Cover up the patient.
  + Ensure that he is comfortable.
  + Thank him.
  + Summarise your findings and offer a differential diagnosis. Don’t fret over your diagnosis as even experienced surgeons are notoriously poor at differentiating between indirect and direct inguinal hernias. Apart from inguinal and femoral hernias, other (more rare) types of hernia are epigastric hernias that occur in the epigastric area in the midline, Spigelian or semilunar her­ nias that occur on the outer border of the rectus muscles, umbilical and paraumbilical hernias that occur at or around the navel, and incisional hernias that occur at the site of an old surgical incision.
  + Wash your hands.

**Features of hernia and examination in infants**

The infant or child with an inguinal hernia generally presents with an obvious bulge at the internal or external ring or within the scrotum.

The parents typically provide the history of a visible swelling or bulge, commonly intermittent, in the inguinoscrotal region in boys (fig. 3, 4) and inguinolabial region in girls.

The swelling may or may not be associated with any pain or discomfort. More commonly, no pain is associated with a simple inguinal hernia in an infant. The parents may perceive the bulge as being painful when, in truth, it causes no discomfort to the patient.

The bulge commonly occurs after crying or straining and often resolves during the night while the baby is sleeping.

Indirect hernias are more common on the right side because of delayed descent of the right testicle. Hernias are present on the right side in 60% of patients, on the left in 30%, and bilaterally in 10% of patients.

If the patient or the family provides a history of a painful bulge in the inguinal region, one must suspect the presence of an incarcerated inguinal hernia. Patients with an incarcerated hernia generally present with a tender firm mass in the inguinal canal or scrotum. The child may be fussy, unwilling to feed, and inconsolably crying. The skin overlying the bulge may be edematous, erythematous, and discolored.

|  |  |
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|  |  |
| **Fig. 3.** Typical appearance of an infant with a large right indirect inguinal hernia. The right scrotal sac is enlarged and contains palpable loops of bowel and fluid. | **Fig. 4.** A premature baby boy with bilateral giant  inguinoscrotal hernias. |

Examine the patient in both supine and standing positions.

Physical examination of a child with an inguinal hernia typically reveals a palpable smooth mass originating from the external ring lateral to the pubic tubercle.

The mass may only be noticeable after coughing or performing a Valsalva maneuver, and it should be reduced easily. Occasionally, the examining physician may feel the loops of intestine within the hernia sac.

In girls, feeling the ovary in the hernia sac is not unusual; it is not infrequently confused with a lymph node in the groin region. In boys, palpation of both testicles is important to rule out an undescended or retractile testicle.

Inguinal hernia incarceration: The bowel can become swollen, edematous, engorged, and trapped outside of the abdominal cavity, a process known as incarceration.

Hernia and hydrocele: In boys, differentiating between a hernia and a hydrocele is not always easy. Transillumination has been advocated as a means of distinguishing between the presence of a sac filled with fluid in the scrotum (hydrocele) and the presence of bowel in the scrotal sac.

Silk sign: When the hernia sac is palpated over the cord structures, the sensation may be similar to that of rubbing 2 layers of silk together. This finding is known as the silk sign and is highly suggestive of an inguinal hernia. The silk sign is particularly important in young children and infants, in whom palpation of the external inguinal ring and inguinal canal is difficult because the patients' small size.

Spontaneously reducing hernia: Inguinal hernias that spontaneously reduce (ie, they are only noticed by the parents or caregivers and elude the examining physician) are not unusual. In such cases, maneuvers to increase the patient's intra-abdominal pressure may be attempted. Lifting the infant's or the child's arms above the head may provoke crying or a struggle to get free and thus increased intra-abdominal pressure. Older children can be asked to cough or blow up a balloon.

**ALGORITHM OF PRACTICAL SKILL No 2 (OSCES STATION 25)**

**NASOGASTRIC INTUBATION**

***Purpose:***

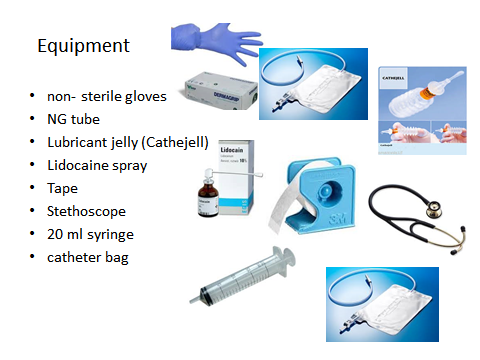
Nasogastric (NG) intubation can be performed for feeding or drug administration purposes, decompression of the stomach to drain the stomach’s contents (in case an emergency surgery is required) and to control the stomach’s content (when bleeding is seen).

***Size of the NG tube:*** The size of the NG tube should be chosen according to the age of the pediatric patient.

|  |  |
| --- | --- |
| Age of the patient | Size of the NG tube (in mm) |
| Newborns | 3 mm |
| Children under the age of 3 months | 4 mm |
| Children under the age of 1 year | 6 mm |
| Children age 2-5 years | 10 mm |
| Children over the age of 5 years | 12 mm |
| Children age 9-14 years | 15 mm |

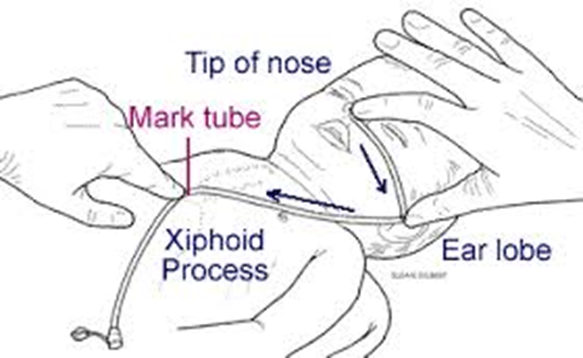
***Equipment needed for performing a NG intubation:***

|  |
| --- |
| Pair of non- sterile gloves |
| NG tube of appropriate size according to the age of the patient |
| Lubricant jelly (Cathejell) |
| Lidocaine spray |
| Tape |
| Stethoscope |
| A 20 ml syringe |
| A catheter bag |



***Before starting:*** - You should introduce yourself to the patients’ parents - You should explain why the procedure is needed and how it will be performed - You should receive a written consent for performing the procedure

***The procedure (patient in supine position):*** - Gather the equipment - Wash hands and put on gloves - Pick the appropriate size of the NG tube and measure the length of its’ insertion- place the tip of the tube at the nostril and  extend the tube behind the ear and then to the xiphoid process - Lubricate the tip of the NG tube with the lubricant - Spray the preferred nostril with lidocaine - - Insert the NG tube into the preferred nostril and slide it along the floor of the nose into the nasopharynxs (aim straight back towards the occiput) - If the child coughs or gags, slightly withdraw the tube and leave him some time to swallow - Insert the tube to the required length, ensure that the tip of the tube is in the stomach - Inject 20 ml of air into the tube and listen over the epigastrium with your stethoscope- you should hear a “popping” sound (if doubt about the NG tube being in gaster perform an X-ray) - Tape the tube to the nose and/ or to the side of the face - Attach catheter bag to the NG tube



**ALGORITHM OF PRACTICAL SKILL No 3 (OSCES STATION 60)**

Neonatal examination

Specifications: A mannequin in lieu of a baby. The baby’s ‘mother’ is also in the room.

Before starting

• Introduce yourself to the mother, and confirm the baby’s name and date of birth.

• Explain the examination, and ask for consent.

• Wash your hands.

• Ask the mother about:

– complications of the pregnancy, if any

– type of delivery and any complications

– the baby’s gestational age at the time of birth

– the baby’s birth weight

– the baby’s feeding, urination, and defecation

– any concerns that she might have about the baby

– how she herself is coping with the new arrival

The examination

**General inspection**

• Although it is important to be systematic, an opportunistic approach to the examination may be necessary.

• Note size, colour (e.g. cyanosis, jaundice), posture, tone, movements, skin abnormalities (e.g. birth marks, petechiae, rash, haemangioma, Mongolian blue spot), and any other obvious abnormalities (e.g. dysmorphic features or birth trauma such as forceps marks or chignon). Are there any signs of pain or respiratory distress?



Figure 1. Neonatal examination, general order of the examination

**Head**

• Gently palpate the anterior and posterior fontanelles for bulging (raised intracranial pressure) or depression (dehydration).

• Measure the head circumference with the tape measure passing above the ears. Head circumference in the neonate should be 33–38 cm.

**Face**

• Inspect the face for dysmorphological features, e.g. dysplastic or folded ears, upward slanting palpebral fissures, and a flat nasal bridge (all may be seen in Down syndrome).

• Inspect the sclerae for redness (subconjunctival haemorrhage related to birth trauma) and the irises for Brushfield spots (Down syndrome).

• Using an ophthalmoscope, test the red reflex (congenital cataracts if the red reflex is absent, retinoblastoma if instead there is a white reflex) and pupillary reflexes.

• Test eye movements (squint).

• Check the patency of the ears and nostrils.

• Elicit the rooting reflex by lightly touching a corner of the baby’s mouth.

• Introduce a finger into the baby’s mouth and palpate the roof of the mouth with the finger pulp

to assess the sucking reflex and soft palate (cleft palate).

• Also examine the soft palate using a torch and spatula.

**Chest**

• Inspect the chest for signs of laboured breathing and for deformities, e.g. pectus carinatum, pectus excavatum, shield-shaped chest with widely-spaced nipples (Turner syndrome).

• Take the brachial and femoral pulses, one after the other and then both at the same time (brachio-femoral delay). Pulse rate in the neonate should be 100–160.

• Palpate the precordium and locate the apex beat.

• Auscultate the heart using the bell of your stethoscope (congenital heart defects).

• Auscultate the lungs using the diaphragm of your stethoscope. Turn the infant over and listen over the back. The respiratory rate should be less than 60 breaths per minute.

**Back**

• Examine the spine, focusing on the sacral pit (neural tube defects).

• Check the position and patency of the anus (anal atresia).

• Enquire as to when the baby first passed stool. Ideally, this should have been within 24 hours of birth.

**Abdomen**

• Inspect the abdomen and the umbilical stump.

• Palpate the abdomen.

• Palpate specifically for the spleen, liver, and kidneys (thumb in front, finger in the loin), and for any masses.

• Auscultate for bowel sounds.

• Feel in the inguinoscrotal region for inguinal hernias.

• Examine the genitalia, in male infants note the position of the urethral meatus (hypospadias) and feel for the testicles (undescended testes).

• Feel for the femoral pulses (coarctation of the aorta).

**Hips**

• Ortolani test. With your thumbs on the inner aspects of the thighs and your index and middle fingers over the greater trochanters, flex the hips and knees to 90 degrees and then abduct the hips (an audible and palpable clunk indicates relocation of a dislocated hip).

• Barlow test. Next, adduct them whilst applying downward pressure with your thumbs (an audible and palpable clunk indicates an unstable hip that can be dislocated).



Figure 2. Ortolani test and Barlow test.

**Arms and hands**

• Inspect the arms and hands, paying particular attention to the palmar creases (Simian crease – Down syndrome).

• Count the number of digits on each hand (polydactyly).

**Feet**

• Inspect the feet for deformities such as club foot and ‘sandal gap’ and test their range of movement.

• Count the number of digits on each foot (polydactyly).

**Posture and reflexes**

• Head lag. Lay the baby supine and pull up the upper body by the arms – the head should first ‘lag’ back, then straighten and fall forward.

• Ventral suspension. Hold the baby prone – the head should lie above the midline.

• Moro or startle reflex. Lift the head and shoulders and then suddenly drop them back – the arms and legs should abduct and extend symmetrically, and then adduct and flex (NB. This test should be conducted as safely and sensitively as possible. For instance, it could be carried out with the baby only slightly raised from the cot mattress.).



Figure 3. Moro reflex

• Grasp reflex. Place a finger in the baby’s hand – the hand should close around your finger.

Ortolani test

Barlow test

After the neonatal examination

• State that you would also measure and weigh the baby and record your findings on a growth centile chart.

• Summarise your findings.

• Reassure the mother, and tell her that you are going to have the baby examined by a senior colleague.

**ALGORITHM OF PRACTICAL SKILL No 4 (OSCES STATION 66)**

**Basic Life Support (BLS): Pediatric Algorithm**

1. Check responsiveness; if none, follow steps below,

* Activate emergency response system
* Get automated external defibrillator (AED)

2. Check pulse for < 10 seconds; if no pulse, follow steps below

* If alone, start high-quality cardiopulmonary resuscitation (CPR) at a compressions-to-breaths ratio of 30:2
* If not alone, start high-quality CPR at a compressions-to-breaths ratio of 15:2
* Every 2 minutes, check pulse, check rhythm, and switch compressors
* In infants, start CPR if heart rate (HR) < 60 bpm and poor perfusion despite adequate oxygen and ventilation
* High-quality CPR and changing rescuers every 2 minutes improves a victim’s chance of survival

3. Attach AED as soon as available (for child); if shockable rhythm, defibrillate and then immediately start CPR

**Compressions in children aged 1 year to adolescence**

* Check pulse at carotid artery
* Compression landmarks: lower half of sternum between the nipples
* Compression method: heel of one hand, other hand on top if needed
* Depth: At least one-third anteroposterior (AP) chest diameter
* Depth: At least 2 inches (5 cm)
* Allow complete chest recoil after each compression
* Compression rate: At least 100/min
* Compressions-to-ventilations ratio: 30:2 if single rescuer, 15:2 if multiple rescuers
* Continuous compressions if advanced airway present
* Rotate compressor every 2 minutes
* Minimize interruptions in compressions to < 10 seconds
* Avoid excessive ventilation

Compressions in infants (< 1 year)

See the list below:

* Check pulse at brachial artery
* Compression landmarks: Lower half of sternum between the nipples
* Compression method: Two fingers or thumb-encircling if multiple providers
* Depth: At least one-third AP chest diameter
* Depth: At least 1.5 inches (4 cm)
* Allow complete chest recoil after each compression
* Compression rate: At least 100/min
* Compressions-to-ventilations ratio: 30:2 if single rescuer, 15:2 if multiple rescuers
* Continuous compressions if advanced airway present
* Rotate compressor every 2 minutes
* Minimize interruptions in compressions to < 10 seconds
* Avoid excessive ventilation

Airway

See the list below:

* Children: Head tilted, chin lifted
* Infants: Sniffing position
* Jaw thrust if trauma suspected (children and infants)

Breathing

See the list below:

* Ventilation with advanced airway every 6-8 seconds asynchronous with compressions
* Rescue breathing every 3-5 seconds
* Deliver at about 1 second/breath
* Watch for visible chest rise

Defibrillation

See the list below:

* In children, attach and use AED as soon as available
* In infants, there are currently no defibrillation recommendations
* Minimize interruptions in chest compressions before and after shock
* Resume CPR beginning with compressions immediately after each shock
* In children, use dose attenuator, if available; otherwise, adult pads may be used

ALGORITHM OF PRACTICAL SKILL No 5 (OSCES STATION 103)

WOUND SUTURING

***Specifications***: A pad of ‘skin’ in lieu of a patient. This station most likely requires you to talk through the parts of the procedure and then to demonstrate your suturing technique. For this second part, there can be no substitute for practice, practice, and more practice!

Before starting

• Introduce yourself to the patient, and confirm his name and date of birth.

• Explain the procedure and obtain consent.

• Examine the wound, looking for debris, dirt, and tendon damage.

• Indicate that you would request an X-ray to exclude a foreign body.

• Assess distal motor, sensory, and vascular function.

• Position the patient appropriately and ensure that he is comfortable.

The equipment

• A pair of sterile gloves

• A suture pack

• A suture of appropriate type (monofilament non-absorbable for superficial wounds, absorbable

for deep wounds) and size (3/0 for scalp and trunk, 4/0 for limbs, 5/0 for hands, 6/0 for

face)

• A 5 ml syringe, 21G and 25G needles, and a vial of local anaesthetic (e.g. 1% lignocaine)

• Antiseptic solution

• A sharps bin

The procedure

• Wash your hands.

• Open the suture pack, thus creating a sterile field.

• Pour antiseptic solution into the receptacle.

• Open the suture, the syringe, and both needles onto the sterile field.

• Wash your hands using sterile technique.

• Don the non-sterile gloves.

• Attach a 21G needle to the syringe.

• Ask an assistant (the examiner) to open the vial of local anaesthetic and draw up 5 ml of local anaesthetic. For an average 70 kg adult, up to 20 ml of 1% lignocaine can be safely used, although 5–10 ml is usually sufficient. Epinephrine may be used with lignocaine to minimize bleeding. The maximum safe dose of lignocaine with or without epinephrine is 7 mg/kg and 3 mg/kg respectively. However, avoid injecting epinephrine when anaesthetising the extremities due to the risk of ischaemic tissue necrosis.

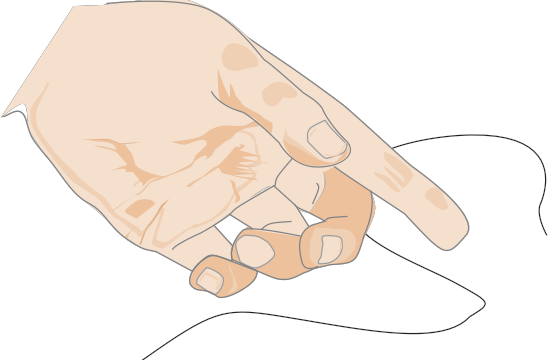
• Discard the needle into the sharps bin and attach the 25G needle to the syringe.

• Clean the wound (use forceps) with antiseptic-soaked cotton wool and drape the field. Dirty wounds may benefit from cleansing with povidone iodine, whereas normal saline can be used to cleanse and irrigate ‘clean’ wounds.

• Inject the local anaesthetic into the apices and edges of the wound. Make sure to pull back on the plunger before injecting to make sure that you are not injecting into a vessel.

• Discard the needle into the sharps bin.

• Indicate that you would give the anaesthetic 5–10 minutes to operate (or as long as it takes for sensation to a needle prick to be lost).





















Use needle-holding forceps to hold the needle approximately two-thirds from the needle tip.

Apply the sutures approximately 3 mm from the wound edge and 5–10 mm apart. Use needleholding forceps to hold the needle and toothed forceps to pick up the skin margins. Knot the sutures around the needle-holding forceps.

After the procedure

• Clean the wound and indicate that you would apply a dressing.

• Assess the need for a tetanus injection.

• Give appropriate instructions for wound care (in particular, if the wound becomes painful or inflamed, it should be brought back to medical attention), and indicate the date on which the sutures should be removed (e.g. face 3–4 days, scalp 5 days, trunk 7 days, limbs 7–10 days, feet 10–14 days).

• Ask if the patient has any questions or concerns.

• Thank him.

**Algorithm of practical skill No 6 (OSCEs station 106)**

**Blood tests interpretation**

1. Reference ranges are based on Gaussian or normal distribution, and usually include about95% of the population. This means that a result only slightly outside the reference range is not necessary ‘ abnormal’.
2. Reference ranges do vary from one laboratory to another- don’t let this confuse you!

**Full blood count (FBC/CBC)**

**Normal range**

**Нb 13-18g/dl(males);11,5-16g/dl(females)**

**RCC 4,5-6,5˟1012(males );3,9-5,6˟1012 (females)**

**PCV (Нt ) 0,4-0,54(males ); 0,37-0,47 (females )**

**WCC 4,0-11,0˟109//l**

neutrofils 2,0-7,5**˟**109//l (40-75% WCC)

lymphocytes 1,3-3,5**˟**109//l (20-45%)

eosinophils 0,04-0,44**˟**109//l (1-6 %)

basophils 0-0,10**˟**109//l (0-1%)

monocytes 0,2-0,8**˟**109//l (2-10%)

**Platelets** 150-400**˟**109//l

**Haemoglobin (Нb)** and red cell count (RCC) are increased in dehydration ,chronic hypoxia, and polycytemia. The term ‘anemia’ describes a Hb of <13g/dl(males);

11,5-g/dl(females). Anaemia has many causes, including iron deficiency, vitamin В12 deficiency, chronic illness, blood loss,and cell destruction.

**Packed cell volume (PCV) or hematocrit** is the fraction of total blood volume occupied by red cells; it decreasesin anemia and increases in dehydration, chronic hypoxia, and polycythemia.

A rised **white cell count (WCC)** or leucocytosis may indicate infection,major tissue damage, or certain lymphoproliferative disorders. The differential white cell blood count is useful in determining the probable cause of leucocytosis. For example, a rised neutrophil count or neutrophilia may indicate acute bacterial infection, acute inflammation, or major tissue damage; a raised eosinophil count or eosinophilia may indicate an allergic reaction or parasitic infection; and a raised lymphocyte count may indicate an acute viral infection, lymphoma,or an infection such as TB or pertussis. A depressed WCC may indicate overwhelming sepsis, djne marrow failure/damage, or myelodisplastic disorder.

A raised **platelet count** or thrombocytosis may result from hemorrhage, chronic inflammatory conditions, hyposplenism, and certain myeloprolipherative disorders,e.g. chronic myelogenous leukaemia. A low platelet count or thrombocytopaenia may result from decreased platelet production (e.g. vitamin В12  deficiency, infection, cancer treatment, portal hypertention), increased platelet destruction ( e.g.immuno thrombocytopaenic purpura, disseminated intravascular coagulation, systemic lupus erythematosus) ,or certain drugs.

**Coagulation/clotting tests.**

**Normal range**

**РТ 10-14 s**

**АРТТ 35-45 s**

**ТТ 10-15s**

**INR 0,9-1,2**

A lack of factors 1,2,5,7,10 or fibrinogen leads to an increase in **protrombin time (PT).** PT thus tests the extrinsic system and is prolonged by warfarin treatment, vitamin K deficiency,liver disease.

A lack of factors 1,2,5,8,9,11 or 12 leads to an increase in activated partial thromboplastin time **( APTT).** APTT thus tests the intrinsic system and is prolonged by heparin treatment,haemophilia, liver disease.

**Thrombin time (TT)** is prolonged by a deficiency of factor 1 ( fibrinogen), heparin treatment.

**INR** is the ratio of PT to mean PT in normal population, and should thus be

around 1. Target INR for DVT and PE prophylaxis is 2-3 (3-5if recurrent), but 3-4 for prosthetic metallic heart valves.

**Liver function tests**

**Normal range**

**Bilirubin 3-17 mmоl/l**

**АLТ 5-35 I|/U**

**АSТ 5-35 I|/U**

**ALP 30-150 I|/U**

**GGT 11-51 I|/U( males); 7-33 I|/U( females)**

**Albumin 35-50 g/l**

The amount of **bilirubin** in the blood reflects the balance between that produced by red cell destruction and that removed by the liver. A raised bilirubin level resblts either from diseases causing increased red blood cell destruction, diseases causing hepatocellular damage, or diseases causing biliary obstruction and thereby restricting the excretion of bilirubin.

Raised **ALT** and **AST** suggests hepatocellular damage. ALT (alaninaminotransferase) is a relatively specific marker of hepatocellular damage, and is most raised in the acute phase. Although ALT is also present in cardiac muscle, the rises seen in myocardial infarction are comparatively small. AST is a less specific marker of hepatocellular damage than ALT and may also be raised in myocardial infarction,skeletal muscle damage, haemolysis, pregnancy,and exercise.

Raised **ALP** and **GGT** suggests biliary obstruction.ALP (alkaline phosphatase) is raised in biliary obstruction, hepatocellular damage, some bone diseases, and pregnancy. GGT ( gammaglutamil transferase) is raised in alcohol consumption, and also in biliary obstruction and hepatocellular damage.

**Albumin** is a genuine test of liver function and falls in chronic liver disease. Other causes for a fall in albumin include malnutrition, malabsorbtion, nephritic syndrome, burns, pregnancy, and overhydration,e.g. with IV fluids. A rise in albumin is usually the consequence of dehydration/

**ALGORITHM OF PRACTICAL SKILL No 7 (OSCES STATION 109)**

**Chest X-ray interpretation**

A systematic approach to interpreting X-rays not only fills out the time and impresses the examiner, but also minimises your chances of missing any abnormalities. Before saying anything, it is an excellent idea to spend one minute looking at the X-ray, rubbing your chin and organising your thoughts.

1. The X-ray

• Name and age of the child.

• Date of the X-ray.

• Projection: PA, AP, or lateral? AP films are normally labelled, but PA films (the most common type of projection) are often left unmarked. If in doubt, examine the scapulae. With PA films, the patient lifts his arms, thereby withdrawing the scapulae from the lung fields.

• Erect or supine?

• Rotation – if there is no rotation, the distances from the vertebral spines to the medial ends of the clavicles should be equal.

• Penetration – if penetration is normal, the lower thoracic vertebral bodies should be just discernible through the heart shadow. If they cannot be discerned, the film is under-penetrated and the lungs will appear more opaque than they ought. If, on the other hand, they are very clear, the film is over-penetrated and the lungs will appear more translucent (blacker) than they ought.

• Inspiration – if the chest is appropriately inflated, five or six ribs should be visible above the diaphragm anteriorly, and ten posteriorly. A greater number of ribs above the diaphragm suggests hyperinflation, as in COPD.

Erect or supine?

An X-ray can be confirmed as having been taken in the erect position if the gastric air bubble is found lying under the left hemidiaphragm. AP films are almost invariably taken supine, and this has major implications for interpretation. A supine film differs from an erect film in that:

• there is an enlarged heart size.

• the diaphragm is higher, resulting in an apparent decrease in lung volume.

• pleural fluid levels lie vertically, resulting in an opacification of the lung field.

• any prominence of upper zone vessels does not suggest left heart failure.

2. Obvious abnormalities and interventions

Scan the film and comment on any obvious abnormality or abnormalities. Make a note of any visible chest drains, ECG pads, etc.

3. The skeleton

Inspect the ribs, shoulder girdles, and spine. Bones may be more translucent in older people. Check for irregular edges suggestive of fracture, especially in the ribs. Check for areas of relative translucency or opacity in the bones, suggestive of, respectively, lytic and sclerotic bony metastases. Note any extra or missing ribs, e.g. a cervical rib.

4. The soft tissues

Inspect the breasts, the chest wall, and the soft tissues of the neck. Look for any distortion, and for any opacities and translucencies. In a female, check for both breast shadows.

5. The lungs and hila

*The lungs:* check the lung volumes, then carefully inspect the lung fields for any opacity (e.g. masses, collapse, consolidation, and pleural effusion) or radiolucency (e.g. pneumothorax and bullae).

*The hila:* inspect the hila, the densities created by the pulmonary arteries and the superior pulmonary veins of each lung for any abnormal opacities. The hila ought to be of similar size, shape, and density. Causes of increased size and density (either unilaterally or bilaterally) include lymphadenopathy (e.g. from infection, neoplasia, sarcoidosis) and pulmonary hypertension. Check the positions of the hila: the left hilum should be 2–3 cm higher than its right counterpart. If not, this may suggest lung collapse or dextrocardia.

6. The pleura

Systematically check *all* lung margins, looking for pleural opacity, pleural displacement, and loss of clarity of the pleural edge (the so-called *silhouette sign*).

7. The diaphragm

Inspect the diaphragm and the area underneath it (the pneumoperitoneum). The right hemidiaphragm should be higher than the left. Blunting of the costophrenic angles suggests pleural effusion and/or consolidation.

8. The mediastinum and heart

*Mediastinal shift*: inspect the trachea for deviation to one side along with the rest of the mediastinum. An area of collapse draws in the mediastinum; tension pneumothorax pushes it away.

*Cardiothoracic ratio (CTR)*: divide the maximal diameter of the heart by the maximal diameter of the chest. In a PA film the CTR should be 0.5 or less.

*Mediastinum*: inspect the trachea and right and left main bronchi. Then inspect the aortic arch, the pulmonary artery, and the heart. Are there any abnormal opacities (masses) or translucencies (pneumomediastinum)? Widening of the aorta and pulmonary arteries suggests, respectively, aortic aneurysm and pulmonary hypertension. Blurred or indistinguishable heart borders suggest collapse or consolidation. Remember to look behind the heart shadow for lung masses, a hiatus hernia, and left lower lobe collapse.

9. Summarise your findings

Conditions most likely to come up in a chest X-ray interpretation station

Pneumonia

• Consolidation (opacification of variable density), possibly interspersed with air bronchograms (pockets of translucency corresponding to airways that are still filled with air). Unlike with an effusion or collapse, the outline of an area of consolidation is often poorly defined. Air space filling with pus is the hallmark of bacterial pneumonias; viral pneumonias tend to cause a more interstitial pattern and predominantly hazy ground glass opacification. Pneumonia may be accompanied by a pleural effusion.

Pleural effusion

• Depending on the size of the effusion: blunting of the costophrenic angle; obscuring of the outline of the hemidiaphragm; opacification of the inferior hemithorax associated with a meniscus shape of the fluid at its upper, lateral margin; opacification of the entire hemithorax; displacement of the mediastinum to the contralateral side.

Pulmonary oedema

• In cardiogenic pulmonary oedema, the pattern may include cephalization of the pulmonary vessels, Kerley B lines or septal lines, peribronchial cuffing, perihilar haziness and blurring of the normally sharp hilar vessels, ‘bat’s wing’ haziness, cardiomegaly, pleural effusion.

COPD

• Hyperinflated lungs with flattened hemi-diaphragms, hyperlucent lungs, bullae.

Interstitial pulmonary fibrosis

• Bilateral reticular or reticulo-nodular pattern, loss of lung volume, honeycomb lung in late stages.

Collapse

• May be limited to a single lobe. Like pleural effusion, associated with an area of opacity. Loss of lung volume distorts appearance of other structures (including trachea, mediastinum, and diaphragm), which are drawn towards the area of collapse.

Pneumothorax

• Radiolucent area beyond collapsed lung with absence of pulmonary vessel markings beyond the white line of the pleura; in tension pneumothorax, displacement of the mediastinum to the contralateral side, flattening of the hemi-diaphragm, soft tissue emphysema.

Tuberculosis

• Can manifest as multifocal consolidation or nodules, round relatively opaque areas that are less than 3 cm in diameter, with spread to regional lymph nodes. This leads to subsequent scarring with calcification of the lung parenchyma and lymph nodes. Cavitation of the lesions tends to occur late, with the lesions marked by dense walls and dark air-filled centres, sometimes with a fluid level. Miliary TB is associated with small (1–5 mm in diameter) military nodules throughout the lungs.

Lung cancer (extremely rare in children)

• May present as a single lesion (primary malignancy or single metastasis) or as multiple lesions (multiple metastases) which can vary greatly in size. Compared to other differentials such as pneumonia, TB, abscess, and benign tumours, malignant lesions are likely to be irregular in shape. They may be associated with collapse, mediastinal shift, and lymphadenopathy. Note that, like TB lesions, malignancies, abscesses, and (occasionally) rheumatoid nodules can cavitate.

Rib fractures

**ALGORITHM OF PRACTICAL SKILL No 8 (OSCES STATION 110)**

**ABDOMINAL X-RAY INTERPRETATION**

A systematic approach to interpreting X-rays not only fills out time and impresses the examiner, but also minimises your chances of missing any abnormalities. Before saying anything, it is an excellent idea to spend one minute looking at the X-ray and organising your thoughts.

1. The X-ray

• Name, age, and sex of the patient.

• Date of the X-ray.

• Confirm size of area covered.

• PA or AP? (They are usually AP.)

• Supine (usual), erect, or lateral decubitus? (Look at gastric air bubble and fluid levels.)

• Area covered: the entire length (from diaphragm to pubic symphysis) and breadth of the abdomen

should be visible.

• Penetration (lumbar vertebrae should be visible).

• Rotation (not normally an issue as most films are taken supine).

2. Obvious abnormalities, interventions, and artefacts

• Scan the film and comment on any obvious abnormality or abnormalities.

• Make a note of any clearly visible interventions or artefacts (*Table 1*).

|  |  |
| --- | --- |
| Table 1. Abdominal X-ray: interventions and artefacts | |
| Interventions | Surgical clips, retained surgical instruments or swabs, nasogastric tube, CVP line, intrauterine contraceptive device, renal or biliary stents, endoluminal aortic stent, inferior vena caval filter |
| Artefacts/other | Pyjama bottoms, coins in pockets, body piercings, bullets, drugs (‘bodypackers’), even, unfortunately, small animals |

***3. Skeleton***

Inspect the:

• Lower rib cage.

• Lumbar vertebrae (scoliosis).

• Sacrum and sacroiliac joints (sacroiliitis, indicated by blurring, sclerosis, and ankylosis of the

sacroiliac joint).

• Pelvis.

• Hip joints and femora (fractured neck of femur).

4. Organs

Inspect the:

• Liver (hepatomegaly).

• Spleen: usually not visualised.

• Kidneys and urinary tract: about three vertebrae in size, the left kidney is higher than the right.

• Bladder: not visualised if empty.

• Prostate: only visualised if calcified.

• Uterus: often not visualised unless it is calcified or an IUD is present.

• Psoas muscles: should be visible either side of the vertebral column

• Stomach.

• Small bowel.

• Large bowel.

* The small and large bowels can be distinguished by their respective sizes, positions, and mucosal markings. The large bowel has a larger diameter and usually sits peripherally, framing a central area containing small bowel loops, not all of which are likely to be visible. Large bowel haustra do not completely traverse the diameter of the large bowel; in contrast, small bowel* valvulae conniventes *traverse the full diameter of the small bowel. If in any doubt, the large bowel can easily be traced through the hepatic and splenic flexures.*

5. Gas, fluid levels, and faecal matter

Gas: depending on its amount and distribution, intraluminal gas may be normal, but intramural or extraluminal gas should be considered abnormal. Intramural gas in an adult usually indicates ischaemic bowel. Free intraperitoneal gas usually indicates bowel perforation. The small bowel should not be greater than 3 cm in diameter, the colon 5 cm in diameter, and the caecum 9 cm in diameter. Look for gas under the diaphragm (pneumoperitoneum), even though this is best visualised on an erect chest X‑ray.

Fluid levels: a fluid level in the stomach and caecum is a normal finding, but multiple fluid levels in the colon should be considered abnormal.

• Faecal matter: the amount and distribution of faecal matter, which is of a mottled grey appearance, can be revealing of underlying pathology.

6. Abnormal calcification

• Calculi in the kidneys, ureters, bladder, gall bladder, and biliary tree.

• Pancreas (chronic pancreatitis).

• Kidneys.

• Abdominal aorta and arteries. Look for aneurysms.

• Costal cartilages, although note that calcification of the costal cartilages is a benign finding in

the elderly.

• Lymph nodes.

***7. Summarise your findings***

Conditions most likely to come up in an abdominal X-ray interpretation station Faecal impaction or overload

• Faecal matter, which is solid, liquid, and gas, has a grey and mottled appearance. Obstruction (mass, stricture, volvulus, intussusception)

• Large bowel: proximal dilatation (>5 cm, and >9 cm for the caecum) owing to the accumulation of gas or faeces. An erect or decubitus X-ray may reveal a small number of long fluid levels proximal to the obstruction. Unless the ileocaecal valve is defective, the small bowel is not involved.

• Small bowel: proximal dilatation (>3 cm) owing to the accumulation of gas or fluid. An erect or decubitus X-ray may reveal a large number of short fluid levels at different heights (‘stepladder’ appearance) proximal to the obstruction.

• Volvulus: may yield a grossly distended inverted U-shaped colonic loop, loss of haustra, and the ‘coffee bean’ sign from a doubled-up loop of distended, oedematous sigmoid colon. Introduction of contrast medium may produce the ‘bird’s beak’ sign, which corresponds to tapering of the section of bowel leading to the point of torsion. Volvulus can occur anywhere in the abdominal GI tract but most commonly affects the sigmoid colon.

• Intussusception: usually associated with signs of small bowel obstruction. It is commoner in children.

• Apple-core sign: not seen without contrast. Produced by a stenosing carcinoma of the colon which causes narrowing at a specific point, reducing the flow of faeces at that point.

Paralytic ileus

• Shares a similar appearance to mechanical obstruction. However, in many cases, both the small and large bowels are distended.

• Can also appear very similar to pseudo-obstruction.

Perforation

• On an erect abdominal X-ray, there may be sub-diaphragmatic gas especially visible on the right side. This is best visualised on an erect chest X-ray.

• On an abdominal X-ray, there may be a circular gas lucency in the central abdomen (football sign).

• Normally, only the inner surface of the bowel wall is visible. However, when there is air on both sides of the wall, the outer surface also becomes visible, producing a 3D appearance (Rigler’s sign).

Biliary, renal, or bladder calculi

• Gallstones may be seen as laminated, faceted, and often multiple radio-opacities in the right upper quadrant, although only in 10–20% of cases.

• Renal calculi may be seen in 80–90% of cases as small, round radio-opacities along the urinary tract; they often obstruct at the level of the pelviureteric junction, pelvic brim or vesicoureteric junction. The urinary tract is visualised by looking along the transverse processes of the vertebrae, across the sacroiliac joint to the level of the ischial spine.

• Bladder calculi may be seen as often large and multiple radio-opacities in the pelvic region.

• Note that calcified costal cartilages, pelvic phleboliths (areas of calcification in veins in the pelvis), and calcified lymph nodes can all be mistaken for calculi.

Appendicolith

• Small, round, calcified radio-opacity in the region of the right Iliac fossa.

Inflammatory bowel disease

• Both Crohn’s disease and ulcerative colitis result in inflammation and oedema of the bowel wall and thus, in general, thickening. In the large bowel, this increases the size of the haustral folds, leading to ‘thumbprinting’.

• Note that infection and ischaemic colitis can also lead to thumbprinting.

Abdominal aortic aneurysm

• The aorta is not normally visible, but with age can become calcified. Bulging on one or both sides may indicate an aneurysm.

*Learn their signs, especially the barn-door ones such as apple-core and bird’s beak.*