

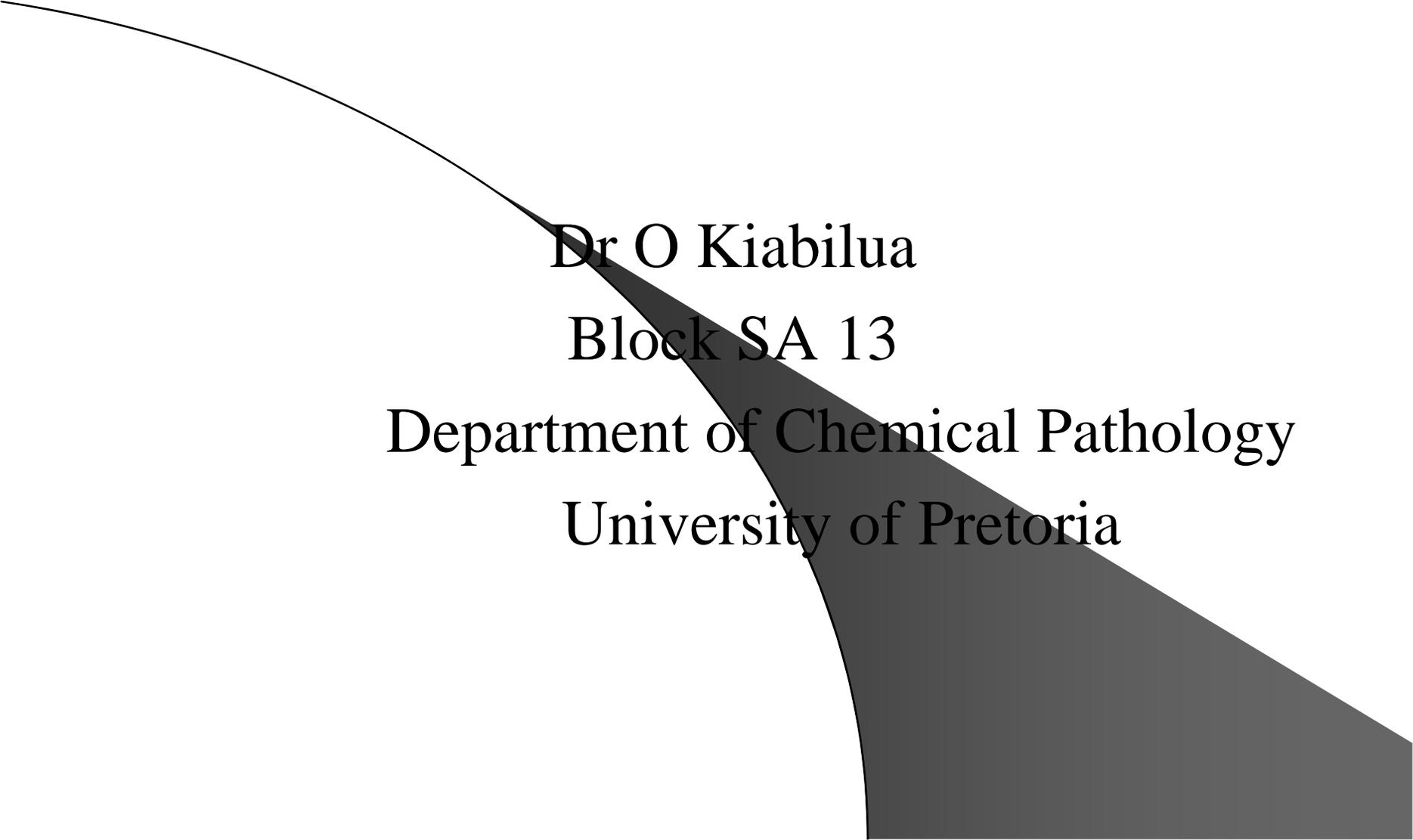
Laboratory tests in emergency medicine

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Acute abdomen

The diagnosis depends :

- The clinical examination,
- Experience of the examiner
- High degree of clinical suspicion

Laboratory investigations play a minor role:

- Evaluation of the patient fluid and electrolyte status
- Confirmation or exclusion of disorders which result in specific biochemical abnormalities (e.g acute pancreatitis, obstructed bile duct)

Causes of acute abdomen

- **Abdominal causes:**

GIT:

- **Obstruction:small and large bowel**
- **Perforation:small and large bowel,peptic ulcer**
- **Infection: appendicitis, diverticulitis, gastro enteritis**

Vascular:

- **Dissecting aneurysm;ruptured aneurysm**
- **Mesenteric embolus/thrombosis**

Pancreas, hepatobiliary, spleen:

- **Acute pancreatitis; acute cholecystitis; acute cholangitis**
- **Acute hepatitis; splenic rupture**

Gynaecological:

- **Ovarian torsion;rupture cyst/follicle**
- **Ectopic pregnancy, salpingitis**
- **Endometritis, uterus rupture**

Urinary tract:

- **Urolithiasis; acute pyelonephritis**

Causes of acute abdomen (cntd)

- Extra-abdominal causes

Endocrine:

- DKA; Addisonian crisis

Hematological:

- Acute leukemia, sickle cell anemia

Metabolic:

- Acute porphyria, Uraemia, Hyperlipoproteinemia

Drugs/toxins:

- Lead toxicity; drug withdrawal

Supradiaphragm area:

- MI; pericarditis; pulmonary infarct
- Pneumothorax; pneumonia

Routine tests

- Plasma electrolyte and creatinine
- Plasma glucose
- Blood gas evaluation

But if the cause is obscure or diagnosis difficult:

- Hb, WCC
- Pl.amylase
- LFT
- Cardiac enzymes
- Pl.glucose and ketones
- Ur,screen for PBG and porphyrins

Lab approach in acute abdomen

- **Blood Hb:Haemorrhage**
- **Blood wcc:Infection**
- **Pl amylase:-Acute pancreatitis**
 - Perforated gut
 - Ectopic pregnancy
 - DKA
- **LFT:hepatobiliary disease**
- **Cardiac enzymes :MI**
- **Pl.glucose:DKA**
- **Urinary PBG :-if normal(porphyria unlikely)**
 - if increase check for faecal porphyria:
 - If increase: HCP or Variegata porphyria
 - If normal : AIP

Acute pancreatitis (AP)

Major causes of AP:

- Alcohol abuse
- Biliary tract disease

Pl.amylase:

- Often Grossly elevated raised (>10 X URL)
- May be normal in severe haemorrhagic pancreatitis
- Elevated in GIT diseases:>1000 U/L (perforated peptic ulcer;GIT obstruction;ruptured ectopic pregnancy;after morphine injection)

Lab findings:

- S-amylase and lipase
- of other proteases

Associated biochemical abnormalities :

LFT :

- GGT (in alcoholism)
- Direct bilirubin : Biliary tract disease is associated with 30-70% of cases of pancreatitis

Acute pancreatitis(AP)

Electrolytes and RFT:

- AP can cause ARF(due to dehydration or shock)/Metabolic acidosis
- Renal failure is associated with moderate hyperamylasemia (<3xURL)
- Hypo Na,Hypo K and metabolic alkalosis due to vomiting and dehydration
- **Lipogram:**
- **TGS > 10 mmol/l** (familial hypertriglyceridemia)
- AP (alcohol related) may lead to temporary hypertriglyceridemia

Serum Calcium:

Hypocalcemia(in 50 % of AP)

- Transient,1.7-2.0 mmol/L, asymptomatic
- Lipase release by damaged pancreatic cells cause release of FFA that cause sequestration of Ca^{2+} (saponification)
- HypoMg (poor diet in alcoholics)

Long standing hypercalcemia (in Iry Hyperparathyroidism) may be a minor cause of pancreatitis

Lab findings in AP (cntd)

Pl.Glucose

- Normal Pl.glucose: hormonal balance, both glucagon and insulin .
- If P-glucose:
 - Temporary:stress (cathecolamines)
 - Persistent :significant loss of normal pancreatic tissue – poor prognosis
- 30-60 % of patients with DKA have an associated hyperamylasemia (?decreased renal clearance)

Diagnostic tests of AP

- Serum Amylase
- Urine Amylase
- Isoamylase
- Lipase
- Trypsin
- Other: elastase, phospholipase A2

Following an acute attack of pancreatitis :

- Amylase rises in 2-12 Hr
- Reaches a max at 12-24 Hr
- Returns to normal within 3 days
- If levels remains or rises following an attack of AP (probably pancreatic pseudocyst)

Urine amylase

- **If s-amylase is , determination of U-amylase does not provide additional information**
- **Useful if high clinical suspicion of pancreatitis, with onset of abdominal pain 2-3 days earlier**
- **A low or normal Ur.amylase in association with s- amylase (in renal failure or macroamylasemia)**
- **Amylase:creatinine ratio (spot urine):**
 - U-Amy/S-Amy x S-Creat/U-Creat X 100**
 - Normal < 7%**
 - Increased (>7%) :**
 - Acute pancreatitis (↓ tubular reabsorption)**
 - Non pancreatic causes :CRF,DKA,severe burns**

S-lipase

- Released into GIT for digestion of triglycerides
- Rarely detectable in normal individual
- Raises in parallel with s-amylase in AP

Drawbacks similar to s-amylase :

- Not specific to pancreatic disease
- Extra pancreatic source of lipase: liver, intestine
- s-lipase and s-amylase in intra-abdominal extra-pancreatic causes of secondary AP
- levels in renal failure (↓ catabolism)

Possible advantage over amylase:

- Normal in macroamylasemia
- Falls slower than S-amylase, remains longer in AP
- Normal in fallopian tube and salivary gland disease

Other markers

- S-Trypsin
- S-Elastase
- Phospholipase A2

Not significantly better than amylase

Acute porphyria

Rare cause of acute abdomen

Diagnosis may be suggested:

- History of abdominal pain associated with ingestion a drug known to provoke acute attacks eg anaesthesia (barbiturates), pre-menstruation, estrogens, pregnancy, alcohol, stress and fasting
- Observation of dark red urine sample on standing
- Very important to exclude because surgery is excluded and anaesthesia is life threatening

Acute porphyria (cntd)

Porphyrias responsible for acute attacks:

- Acute intermittent porphyria (AIP)
- Porphyria Variegata (PV)
- Hereditary coproporphyria (HCP)

Clinical picture of acute attack:

- Abdominal pain
- Neuropsychiatric disturbances (depression, psychosis)
- Peripheral neuropathies (myalgias, paresthesias, weakness)
- Cardiovascular: tachycardia, hypertension
- Electrolyte disturbances :SIADH (Hypo Na)
- Skin involvement in PV and HCP

Acute porphyria

Lab investigation:

Random ur.porphobilinogen (UPBG) determination
(protected against light)

- If +ve, confirm with stool porphyrins levels to determine the type of acute porphyria:
 - Normal fecal porphyrins in AIP
 - Coproporphyrinogen III in hereditary coproporphyria
 - Protoporphyrin I in porphyria variegata

- If negative :exclude acute porphyria

Ectopic pregnancy

Laboratory investigation:

- Screening test: urine or serum B-HCG around 6 to 10 wks
- Serum test detects levels as low as 5 IU/L
- Urine testing detects levels as low as 20-50 IU/L
- If pregnancy strongly suspected with –ve urine test, serum test will be confirmatory

ULTRASONOGRAPHY (transabdominal/transvaginal):

- Gestational sac should be detectable in uterus above certain cut-off value for HCG.
- If absent : confirms diagnosis of ectopic pregnancy

B-hCG

- In normal pregnancy, the BHCG rises and doubles every 2 days in the 1st trimester
- A 66 % increase of BHCG over 48 hr suggests fetal viability
- A rising BHCG below 50 % suggests miscarriage or ectopic pregnancy (as does plateau). Therefore, serial measurement is often used.
- Ectopic pregnancy may present with raising, falling or plateau BHCG levels
- Subnormal levels of BHCG often suggest non viability, and invasive investigations can be used to differentiate miscarriage from ectopic pregnancy

Progesterone

- Potentially adjunct to serum B-hCG
- Levels are stable and independent of gestational age in the 1st trimester
- Single progesterone levels of 5ng/ml may correctly diagnose pregnancy failure (non viable pregnancy or ectopic pregnancy)
- Progesterone levels >22ng/ml ,may have a high (but not certain) likelihood of viable IU pregnancy

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Case 1

- 20 Yr old woman admitted in hospital following an unsuccessful laparotomy for severe abdominal pain.
- The pain was present for 3 days, persistent, and located in the middle and right abdomen. It was associated with vomiting .
- Normal T°;
- Electrolytes, LFT and amylase : NORMAL
- Similar bout of pain 18 months ago previously when she started taking OCP.

Case 2

- 40 yr old man with a past history of duodenal ulceration, admitted in hospital with a 24 Hr Hx of severe abdominal pain and vomiting
- Had an alcoholic “binge” on the night prior to the onset of the pain
- O/E: Dehydrated. Given morphine for the pain
- Chemistry results:
 - Na=137 mmol/l (132-144)
 - K=3.1 mmol/l (3.2-4.8)
 - Cl=95 mmol/l (98-108)
 - HCO₃= 33mmol/l (23-33)
 - Creat= 150 mmol/l (60-120)
 - Amylase=405 U/L (<300)

Case 3

- Female with history of amenorrhoea came bleeding for 2 days .On clinical examination, uterus size within normal, not tender, cervix is closed but a mass is felt in left adnexia. U/S shows empty uterus, pregnancy test was +ve.
- What is your diagnosis?
 - 1. Ectopic pregnancy
 - 2. Complete abortion with persistent luteal cyst
 - 3. Incomplete abortion
 - 4. None of the above