biomnis
SPECIALISED MEDICAL PATHOLOGY
Focus
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Clinical Cases in Biochemistry (2)

Case number 1: Mr D, a 33-year-old hospital worker, has his blood profile taken for occupational health requirements:

Glucose: 5.6 mmol/L (3.9 – 6.1),
Creatinine: 120 µmol/L (62 – 106),
Urea: 5.0 mmol/L (2.8 – 8,3),
Na: 143 mmol/L (136 – 146),
K: 4.1 mmol/L (3.5 – 4.5),
ASAT : 287 U/L (10 - 50),
ALAT : 144 U/L (10 - 50),
GGT: 43 U/L (8 – 61),
PAL: 85 U/L (40 – 130).
Plasma appearance: normal.

What additional tests could be suggested to the doctor?

A Bilirubin
B Viral hepatitis serology
C Lipase
D CPK
E Myoglobin

Answer: D. An isolated increase in transaminase with an AST/ALT ratio of >1 is evocative of muscular cytolysis. Please note, the AST/ALT ratio is <1 in hepatic cytolysis with the exception of cirrhosis (particularly in cases of chronic alcohol intoxication).

Our patient had a **CPK of 16 515 U/L** (reference values: 25 – 200). After intensive questioning, it seems that he has aggressively started bodybuilding again the weekend before having the blood profile taken, hence the rhabdomyolysis.

Which signs should be monitored?

- CPK (for any decrease);
- The renal profile as kidney failure can be a possible complication of rhabdomyolysis (it is important to ensure that the patient is well hydrated).

Please remember: A rise in transaminase is not synonymous with hepatic cytolysis. The role of the pathologist is important as he/she can avoid costly and unnecessary tests being undertaken (e.g. serology of all hepatotropic viruses).

Case number 2: Mrs B, 38 years old, was hospitalised in the Digestive Diseases Department one week ago following an episode of haemorrhagic rectocolitis.

Creatinine: 64 µmol/L (44 – 80),
Urea: 4.3 mmol/L (2.8 – 8.3),
Na: 153 mmol/L (136 – 146),
K: 4.3 mmol/L (3.5 – 4.5),
Cl: 97 mmol/L (98 – 107),
Total CO2: 28 mmol/L (24 – 32),
Total Protein: 71 g/L (63 – 83)
Anion gap (AG): 14.6 mmol/L (0 – 5).

What should be done next?

A Check the patient's previous results
B Repeat testing

Answer: A et B.

	1st Run	2nd Run	Previous result at from 2 days ago
Creatinine	64		60
Urea	4.3		3.9
Na	153	141	140
K	4.3	3.9	4.1
Cl	97	106	105
CO2 level	28	28	28
Proteins	71		73
Anion Gap	14.6	1.0	0.6

This is an analytical "bug" from the ISE module that showed no error message on the automated analyser.

Please note: the **anion gap** allows for the determination of incoherent electrolyte results. Usually, Na and Cl fluctuate in the same direction, unless there is an acid-base equilibrium issue. In this case, Cl fluctuates in the opposite direction to the CO2 level in order to maintain electroneutrality. For our patient, the CO2 level is normal, which isn't right! Therefore, always closely monitor automated results for any inconsistencies.

Case number 3: Mrs N, 52 years old, was admitted to Infectious Diseases Department, for a pulmonary complication from advanced HIV and diarrhoea.

Creatinine: 41 µmol/L (44 – 80),
Urea: 2.9 mmol/L (2,8 – 8,3),
Na: 131 mmol/L (136 – 146),
K: 5.7 mmol/L (3.5 – 4.5),
Cl: 84 mmol/L (98 – 107),
Total CO2: 43 mmol/L (24 – 32),
Proteins: 70 g/L (63 – 83)
CRP: 122.3 mg/L (< 5)

What should be done next?

Check the patient's previous results.

	Day 0	Previous result from 1 day ago
Creatinine	41	77
Urea	2.9	8,6
Na	131	128
K	5.7 (not haemolysed)	3.1
Cl	84	98
CO2 level	43	18
Proteins	70	56
Anion Gap	122.3	11.3

The patient's previous results do not correspond, especially the CO2 and potassium levels (the day before, potassium at 3.1 mmol/L was consistent with diarrhoea). It was, therefore, necessary to check the labelling of the tube in the laboratory (OK) and to call the ward to inform them of the issue. In the end, it was found to be the result of an identity error during sampling: two patient samples had been mislabelled.

Case number 4: Mr M, an 82-year-old diabetic, came to Accident and Emergency suffering from acute dehydration.

Glucose: 17.6 mmol/L (3.9 – 6.1).
Creatinine: 96 µmol/L (62 – 106),
Urea: 9.2 mmol/L (2.8 – 8.3),
Na: 131 mmol/L (136 – 146),
K: Analysis cancelled, haemolysed plasma,
Cl: 91 mmol/L (98 – 107),
CO2 total: 22 mmolLl (24 – 32),
Proteins: 71 g/L (63 – 83)
Anion gap: 4 mmol/L (0 – 5)
Appearance of plasma: haemolysed

What should be done next?

1. **Quantify the potassium level:** the analyser gave a reading of **2.0** mmol/L
2. **Calculate the corrected sodium result using the Katz** formula (due to hyperglycaemia).

   Na corrected = Na measured + (glucose in mmol/L x 0.3).

   Here, Nac = 131 + (17.6 x 0.3) = 136 mmol/L (normal)
3. **Calculate osmolarity:** 2 x (131 + 2) + 17.6 + 9.2 = 293 (normal).

The potassium result was phoned through. An electrocardiogram was done urgently: the patient was suffering from violent ventricular extrasystoles and was transferred to intensive care.

Comments from the Pathologist, as outlined in the central information system:
"Very severe hypokalaemia despite plasma haemolysis. Result communicated via telephone to the doctor. Tests to be done on a new sample. Results are to be interpreted in light of the patient's clinical details (GI losses?) and therapeutic details (taking diuretics?); indication for urinary electrolyte testing."

Confirmation by blood-gas analysis taken in intensive care: K = 1.7 mmol/L!

Please note: Do not refuse to disclose analysis results (detrimental to the patient). It is up to the pathologist to form an opinion in line with the results, which can be shared and comments can be added.

Conclusion

The results of the laboratory tests should be analysed globally and not individually.
It is important to verify the coherence of previous results in line with the clinical details available and always maintain a critical eye and open mind; communication between the clinician and the laboratory is vital. Additional examinations should always be added in consultation with the prescribing doctor and should not be indiscriminately done as a matter of course (in order to avoid costly, unnecessary tests).

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