**Clinical case 1**

A 38-year-old male patient visited his therapist. The patient, 2 weeks ago, had a medical condition of pneumonia and received treatment with Benzylpenicillin 600mg × 4 times per day during 7 days.

He had no deleterious habit of drinking alcohol or smoking.

General physical examination of the patient revealed generalized yellow discoloration of skin and sclera. Patient complains about fatigue and muscle weakness.

**On physical examination**, he is afebrile but deeply jaundiced.

**Blood pressure** = 105/60 mm Hg, FCC = 102 bpm;

**Shortness of breath and respiratory rate** = 21 bpm;

**Urine is dark: bilirubin** – abs, urobilinoids bodies ++, bile acids – abs

Dark faeces.

In the blood anti-erythrocytes antibodies.

**Laboratory Blood Test Results**

|  |  |  |
| --- | --- | --- |
| CBC | VALUES | REFERENCE RANGES |
| Hematocrit | 30 | Males 39 - 49%Females 35 - 45% |
| Hemoglobin  | 10,8 | Males 13,6 - 17,5 g/dLFemales 12,0 - 15,5 g/dL |
| Red blood cells (RBC) | 3,2 |  4,7 - 6,1 million/cu mm |
| Reticulocyte count | 2,2 | 0,5 - 1,5% |
| White blood cell (WBC) count | 5,800 | 4,800 – 9,000/cu mm |
| Neutrophil count | 60 | 60 - 62% |
| Basophil count | 0,5 | 0 - 1,0% |
| Eosinophil count | 3 | 1. 4%
 |
| Lymphocyte count | 26 | 25 - 35% |
| Monocyte count | 5 | 3 - 7% |
| Thrombocytes  | 210,000 | 150,000 – 450,000/cu mm |
| MCV | 98 | 80 - 100 fL |
| MCH | 33 | 26 – 34 pg |
| MCHC | 34 | 31 - 36 g/dL |

**Biochemical blood tests**

|  |  |  |
| --- | --- | --- |
| Protein total | 7,1 | 6,0 – 8,0 g/dL |
| Albumin | 3,7 | 3,4 – 4,7 g/dL |
| Prothrombin time | 12,2 | 11,0 -13,5 sec |
| Glucose, *serum fasting* | 76 | 60 – 110 mg/dL |
| Glucose, *2 hours postprandial* | 143 | < 150 mg/dL |
| Bilirubin total | 3,1 | 0,1 – 1,2 mg/dL |
| Direct or conjugated bilirubin | 0,7 | 0,1 - 0,5 mg/dL |
| Indirect or unconjugated bilirubin | 2,4 | 0,1 – 0,7 mg/dL |
| Alanine aminotransferase (ALT) | 69 | 7 - 56 IU/L |
| Aspartate aminotransferase (AST) | 57 | 0 – 35 IU/Ll |
| Alkaline phosphatase  | 95 | 40 - 100 U/L |
| Gamma-glutamyl transpeptidase (GGT) | 40 | 9 – 48 U/L) |

1. What changes in bilirubin pigments is attested in this patient? Explain pathogenetic mechanisms
2. What changes in general blood analyses and biochemical blood test are in relation with this pathologic condition?
3. Give pathogenetic chain which reflects changes in steps of bilirubin metabolism in this patient
4. Explain changes of bilirubin fractions (total bilirubin conjugated and unconjugated bilirubin) in the blood. Explain pathogenetic mechanisms.
5. Explain changes which are attested in the urine of this patient. Give pathogenetic mechanisms
6. Explain changes which are attested in the feces of this patient. Give pathogenetic mechanisms
7. What is the clinical significance of seric levels of alkaline phosphatase and Gamma-glutamyl transpeptidase in this patient?

**Clinical case 2**

Patient T, is a 21 y.o. male presented to the emergent department after he noticed his “eyes looked yellow” for the past 1 month. He has no other symptoms but for the past 2 months he noticed easy fatigability, abdominal pain and mild pruritus. He also noted that his urine has become dark. There was no history of jaundice before and he did not report any history of fever, headache or confusion. He has not noted any abdominal swelling or weight loss.

**On physical examination**, he is afebrile but deeply jaundiced.

 **Blood pressure** = 90/60 mm Hg, pulse = 60 bpm and respiratory rate = 16 bpm.

Abdominal exam is notable for enlarged liver 15 cm but no shifting dullness, bulging flanks, or “fluid wave”. There was no splenomegaly.

Thyroid, skin, breast, cardiovascular, chest and neurological exams were unremarkable.

**Urine:** bilirubin++, urobilinoids bodies +, bile acids+

**Laboratory Blood Test Results**

|  |  |  |
| --- | --- | --- |
| CBC | VALUES | REFERENCE RANGES |
| Hematocrit | 41 | Males 39-49%Females 35-45% |
| Hemoglobin | 13,8 | Males 13,6-17,5 g/dLFemales 12,0-15,5 g/dL |
| Red blood cells (RBC) | 4,9 | 4,7-6,1 million/cu mm |
| White blood cell (WBC) count | 4,800 | 4,800–9,000/cu mm |
| Neutrophil count | 48 | 60 -62% |
| Basophil count | 0,5 | 0- 1,0% |
| Eosinophil count | 3 | 1-4% |
| Lymphocyte count | 26 | 25-35% |
| Monocyte count | 5 | 3-7% |
| Thrombocytes | 210,000 | 150,000 – 450,000/cu mm |

**Biochemical blood analysis**

|  |  |  |
| --- | --- | --- |
| Protein total | 5,5 | 6,0 – 8,0 g/dL |
| Albumin | 3,1 | 3,4 – 4,7 g/dL |
| Fibrinogen | 128 | 160 – 450 mgd/L |
| Prothrombin time | 20,2 | 11,0 -13,5 sec |
| Glucose, *serum fasting* | 46 | 60 – 110 mg/dL |
| Glucose, *2 hours postprandial* | 197 | < 150 mg/dL |
| Bilirubin total | 3,8 | 0,1 – 1,2 mg/dL |
| Direct or conjugated bilirubin | 2,4 | 0,1 - 0,5 mg/dL |
| Indirect or unconjugated bilirubin | 1,4 | 0,1 – 0,7 mg/dL |
| Alanine aminotransferase (ALT) | 209 | 7-56 IU/L |
| Aspartate aminotransferase (AST) | 107 | 0 – 35 IU/Ll |
| Alkaline phosphatase (AP) | 115 | 40-100 U/L |
| Gamma-glutamyl transpeptidase (GGT) | 50 | 9–48 U/L |
| Ca++ | 1.9 | 2,1 - 2,6 mmol/L |
| Vitamin A | 28 | 30 – 65 mg/dL |
| Vitamin E | 0,4 | 0,5 – 0,7 mg/dL |
| Vitamin D, 1,25OH | 19 | 20 -76 pg/mL |

1. What changes in bilirubin pigments is attested in this patient? Explain pathogenetic mechanisms

2. What changes in biochemical blood test are in relation with this bilirubin pigment changes?

3. Give pathogenetic chain which reflects changes in steps of bilirubin metabolism in this patient

4. Explain changes of bilirubin fractions (total bilirubin conjugated and unconjugated bilirubin) in the blood. Explain pathogenetic mechanisms.

5. Explain changes which are attested in the urine of this patient. Give pathogenetic mechanisms

6. Explain changes which are attested in the feces of this patient. Give pathogenetic mechanisms

7. What is the clinical significance of seric levels of alkaline phosphatase and Gamma-glutamyl transpeptidase in this patient?

8. What biochemical blood tests and clinical manifestations reflect hypocholia?

9. What biochemical blood tests and clinical manifestations reflect cholemia?

10. What biochemical blood tests reflect impairment of liver functions?

**Clinical case 3**

An 64-year-old woman presented to the emergency department with a 5-day history of jaundice, fever and abdominal pain. The pain was sudden in onset and gradually intensifies in severity, located in the upper abdomen, which radiates directly through the abdomen to the back.

Also, patient has complained about nausea, vomiting and annoying itching. Feces are discoloured and fatty. Last month the patients lost appr. 5 kg and visual impairments was attested.

Physical examination showed sclera icterus and right upper quadrant tenderness, scratches on the skin of the abdomen and legs.

HR = 55 bpm, BP= 85/50mmHg

**Urine is dark:** bilirubin+++, bile acids +++

Abdominal USG – enlargement of the pancreatic head (tumor suspicion).

**Laboratory Blood Test Results**

|  |  |  |
| --- | --- | --- |
| CBC | VALUES | REFERENCE RANGES |
| Hematocrit | 40 | Males 39 - 49%Females 35 - 45% |
| Hemoglobin | 13,8 | Males 13,6 - 17,5 g/dLFemales 12,0 - 15,5 g/dL |
| Red blood cells (RBC) | 4,9 | 4,7 - 6,1 million/cu mm |
| White blood cell (WBC) count | 12,800 | 4,800 – 9,000/cu mm |
| Neutrophil count | 70 | 60 - 62% |
| Basophil count | 0,5 | 0 - 1,0% |
| Eosinophil count | 3 | 1. 4%
 |
| Lymphocyte count | 26 | 25 - 35% |
| Monocyte count | 5 | 1. 7%
 |
| Thrombocytes | 210,000 | 150,000 – 450,000/cu mm |

**Biochemical blood tests**

|  |  |  |
| --- | --- | --- |
| Protein total | 6,8 | 6,0 – 8,0 g/dL |
| Albumin | 3,5 | 3,4 – 4,7 g/dL |
| Fibrinogen | 180 | 160 – 450 mg/dL |
| Prothrombin time | 15,5 | 11,0 - 13,5 sec |
| Bilirubin total | 6,8 | 0,1 – 1,2 mg/dL |
| Direct or conjugated bilirubin | 6,3 | 0,1 - 0,5 mg/dL |
| Indirect or unconjugated bilirubin | 0,5 | 0,1 – 0,7 mg/dL |
| Alanine aminotransferase (ALT) | 40 | 7 - 56 IU/L |
| Aspartate aminotransferase (AST) | 30 | 0 – 35 IU/Ll |
| Alkaline phosphatase  | 155 | 40 - 100 U/L |
| Gamma-glutamyl transpeptidase (GGT) | 105 | 9 – 48 U/L) |
| Serum amylase | 180 | <100 U/L3 |
| Lipase | 98 | < 60 U/L3     |
| Ca++ | 1,4 | 2,1 - 2,6 mmol/L |
| Vitamin A | 21 | 30 – 65 mg/dL |
| Vitamin E | 0,2 | 0,5 – 0,7 mg/dL |
| Vitamin D, 1,25OH | 16 | 20 -76 pg/mL |

1. What changes in bilirubin pigments is attested in this patient? Explain pathogenetic mechanisms

2. What changes in biochemical blood test are in relation with this bilirubin pigment changes?

3. Give pathogenetic chain, which reflects changes in steps of bilirubin metabolism in this patient

4. Explain changes of bilirubin fractions (total bilirubin conjugated and unconjugated bilirubin) in the blood. Explain pathogenetic mechanisms.

5. Explain changes, which are attested in the urine of this patient. Give pathogenetic mechanisms

6. Explain changes, which are attested in the feces of this patient. Give pathogenetic mechanisms

7. What is the clinical significance of seric levels of alkaline phosphatase and Gamma-glutamyl transpeptidase in this patient?

8. What biochemical blood tests and clinical manifestations reflect acholia?

9. What biochemical blood tests and clinical manifestations reflect cholemia?

10. What biochemical blood test reflect impairment of liver functions?