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Харківський національний медичний університет

Кафедра Внутрішньої медицини №3  
Факультет VI по підготовці іноземних студентів

*ЗАТВЕРДЖЕНО*  
на засіданні кафедри внутрішньої медицини №3

«29 » серпня 2016 р. протокол № 13

Зав. кафедри \_\_\_\_\_ д.мед.н., професор Л.В. Журавльова

## МЕТОДИЧНІ ВКАЗІВКИ

для самостійної роботи студентів англійською мовою

з дисципліни «Внутрішня медицина (в тому числі з ендокринологією)  
студенти 4 курсу I, II, III медичних факультетів, V та VI факультетів по підготовці  
іноземних студентів

Дихальна недостатність

Харків 2016

## **Research arterial bloodgas**

### **Overview**

Arterial blood gas analysis study includes determining the partial pressure of oxygen therein ( $PO_2$ ), carbon dioxide ( $PCO_2$ ), pH, and oxygen ( $O_2$  CT), the oxygen saturation  $S_aO_2$ ,  $HCO_3$  concentration. Blood for the studies of gas composition can be obtained by puncture of an artery or catheter inserted into an artery.

### **Purpose of the study**

- ☐ Rate the effectiveness of gas exchange in the lungs.
- ☐ Rate the safety of the system that regulates breathing function.
- ☐ Determine acid-base balance (AAR) of blood.
- ☐ To assess the efficacy of respiratory therapy.

### **Preparation for diagnosis**

- ☐ It is necessary to explain to the patient that the study will determine the effectiveness of the blood oxygen saturation in the lungs and the purification of carbon dioxide.
- ☐ It is necessary to inform the patient that the study sampled arterial blood, let him know when and who will puncture the artery, as well as specify which arteries: radial, brachial or femoral.
- ☐ There are no restrictions in diet and mode of supply is not required.
- ☐ The patient is asked to breathe quietly during the study, and warned of the possibility of discomfort and throbbing pain in the puncture.

### **Blood sampling**

For ☐ punctured artery blood collection or blood taken from the arterial catheter into a syringe containing heparin. After venting the syringe immediately placed in a container with ice and sent to the laboratory.

- ☐ Place puncture press down with a cotton ball for 3-5 minutes or until the bleeding has stopped, and then applied a pressure bandage (if the radial artery punctured, do not bandage the entire circumference of the hand, as it can lead to poor circulation in it).
- ☐ If the patient receives anticoagulant to stop the bleeding from the puncture site it pressed down for more than 5 minutes.
- ☐ In the observation of the patient determine the basic physiological indicators should be particularly attentive to the signs of impaired circulation in the limb distal to the insertion site (swelling, skin discoloration, the occurrence of pain, tingling sensations).

## **The reference values**

Normal indicators of arterial blood gas analysis:

- ☐ PO<sub>2</sub>: 80-100 mm Hg. Art. (CI: 10,6-13,3 kPa).
- ☐ PCO<sub>2</sub>: 35-45 mm Hg. Art. (CI: 4,7-5,3 kPa).
- ☐ pH: 7.35-7.45 (CI: 7.35-7.45).
- ☐ O<sub>2</sub> CT: 15-23% (CI: 0,15-0,23).
- ☐ S a O<sub>2</sub>: 94-100% (CI: 0,94-1,00).
- ☐ HCO<sub>3</sub><sup>-</sup>: 22-25 mEq / L (CI: 22-25 mmol / L).

## **Factors influencing the study results**

- ☐ The factors that distort the results
- ☐ Use the syringe to draw blood without heparin and delayed sending blood samples to the laboratory.
- ☐ contact with air, blood samples (increase or decrease in PO<sub>2</sub> and PCO<sub>2</sub>).
- ☐ presence in a sample of venous blood (decreasing PO<sub>2</sub> and PCO<sub>2</sub> increase).

## **Factors that increase the result**

- ☐ HCO<sub>3</sub>, ethacrynic acid, hydrocortisone, metolazone, prednisone, and thiazide diuretics (increased PCO<sub>2</sub>).
- ☐ fever (higher values of PO<sub>2</sub> and PCO<sub>2</sub>).

Factors that reduce the result

- ☐ Acetazolamide, methicillin, tetracycline and nitrofurantoin (decrease PCO<sub>2</sub>).

## **Deviations from the norm**

Low PCO<sub>2</sub>, O<sub>2</sub> CT and S a O<sub>2</sub> and high PCO<sub>2</sub> may be due to respiratory failure, for example as a result of weakness or paralysis of the respiratory muscles, depression of the respiratory center (head injury, brain tumor, drug overdose), airway obstruction (mucus, tumors). Similar changes were observed in the marked indicators bronchiolar obstruction due to bronchial asthma and emphysema, violation of ventilation-perfusion relationships due to partial blocking of the alveoli and pulmonary capillaries, accumulation of fluid in the alveoli at different lung diseases, pulmonary hemorrhage, and drowning. When the inhaled air contains enough oxygen, PO<sub>2</sub>, O<sub>2</sub> and CT S a O<sub>2</sub> decrease, but PCO<sub>2</sub> may remain normal. This pattern is characteristic of pneumothorax, a violation of diffusion between the alveoli and blood, for example as a result of interstitial fibrosis, and arteriovenous shunting of blood in the lungs. Low O<sub>2</sub> under normal CT PO<sub>2</sub> and S a O<sub>2</sub>, and possibly PCO<sub>2</sub> observed in severe anemia, decrease in BCC and decreasing blood oxygen capacity.

In addition to information about the content of oxygen in the blood, blood gas study provides valuable information on the AAR (see. Violation of the acid-base balance).

### **The study of venous blood gas composition**

Increased oxygenation of venous blood in the area of vascular injury is one of the most reliable signs of arteriovenous aneurysm. This phenomenon is caused by the constant discharge of arterial blood in the venous system, first noted by Brown with multiple congenital arteriovenous fistulas limbs. Phenomenon atmospherization is pathognomonic for the disease or damaged blood vessels, in which there is the formation of abnormal arteriovenous communications.

Blood gas analysis is carried out on the unit Van Slyke, successfully combines the principles of IM Setchenov (extraction under vacuum blood gases) with the principle Holden (displacement blood gas chemical process), or by other methods. The study is simple (a technique described in detail in the respective manuals) and produced relatively quickly.

Since the normal oxygen saturation of venous blood varies between 60-70% for the detection of increased oxygenation should identify the figure in the field of vascular lesions, and on the healthy side. If the oxygen saturation of venous blood on one limb (or side of the body), only 2% higher than in the symmetric parts of the other, then it is an irrefutable proof of the abnormal communications between arteries and veins.

### **RECOMMENDED BOOKS:**

1. Clinical Pulmonology - 2016 (The Clinical Medicine Series Book 19).-343h.
2. Pulmonary Disorders [Sect. 5, Merck manual] 2010.-123p.
3. Pulmonary Pathophysiology : The Essentials by (author) [John B. West](#) 2012 .-20
4. Davidson's Principles and Practice of Medicine 22nd Edition .-Walker, Brian R., FRSE.-2014.-1312p.

Website of the departament: <http://www.vnmed3.kharkiv.ua/>,

Методичні вказівки склав: доц.. Федоров В.О.

Методичні вказівки переглянуто і затверджено на засіданні кафедри: 31 серпня 2016р. протокол №13.

З доповненнями (змiнами).

Завiдувач кафедри  
внутрiшньої медицини №3  
д.м.н. проф..

Журавльова Л.В.