Ministry of Health of Ukraine
Poltava State Medical University
Department of internal medicine No 3 with phthisiology

Approved
at the meetihg of the Department of Internal Medicine No. 3 with Phthisiology
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Methodical instructions for the independent work of students during the preparation for a practical lesson and in class

Academic discipline	Phthisiology
Module №	1
Theme of the lesson 3	Laboratory diagnostics of tuberculosis. Methods of detection MBT. Histological diagnostics of tuberculosis. Curation of patients.
Course	4
Faculty	International
Specialty	Medicine

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1. **Topicality of the theme:** In the process of evolutional development, scientific and technical progress properties of mycobacterium of tuberculosis (MBT), and clinic of tuberculosis, changed. There are clinical forms TB which flow without symptoms. Such motion is observed sometimes at the infiltration and dissemination tuberculosis, but the cases of heavy, started forms of tuberculosis became more frequent: caseous pneumonia, dissemination tuberculosis with sharp, subsharp and chronic motion, which flow under the mask of pneumonia, chronic obstructive diseases of lungs. Clinical thought, knowledge of reasons of development of those or other symptoms of illness, comparisons of basic and second-rate displays of illness, is instrumental in correct establishment of previous diagnosis, aims a doctor at the choice of methods inspections which will allow to eliminate or confirm tuberculosis.

In the conditions of epidemic of tuberculosis to every doctor, regardless of specialty, it is necessary to know not only the first displays of tuberculosis beginning from complaints, features of development of illness and information of objective inspection but also methods of his diagnostics (laboratory, bacteriology).

2. Specific objectives:

To analyze: value of different methods of inspection in diagnostics of tuberculosis, value of different methods of laboratory inspection of sick
To explain: basis symptoms of tuberculosis, aims reveal MBT
To classify: shadow is characteristic for tuberculosis at x-ray inspection of lungs, resistant of MBT
To interpret: results of inspection of the tuberculosis patient, results of blood tests, inspection sputum on MBT
To analyze: pathological changes which can be found out at a review, palpation, percussion and auscultation at the different clinical forms of lungs TB
To make: plan of inspection of patient tuberculosis of breathing and other organs
To offer: to the way of diminishing of infected, morbidity and death rate from TB

3. Base knowledge, abilities, skills, are necessary for study themes (interdisciplinary integration)

Names of previous disciplines	**Skills are got**
Microbiology	Knowledge of exciter of tuberculosis, his properties Pathogenic cultures of MBT for a man, feature of structure of MBT, property. Sequence of painting of stroke on Ziehl-Neelsen
Patphiziology	Knowledge of pathogenic of tuberculosis
Propedevtika of internal illnesses	Ability to collect complaints, anamnesis of disease and life, conduct the objective inspection of patient (review, palpation, percussion, auscultation)
Hygiene	Knowledge of the hygienically mode of stationary separation.
Anatomy	Structure of lungs, parts and segments
Patanatomy	Character of tubercular inflammation (morphological). Structure of tubercular granulomes
Physiopathology	Allergic reactions of fast (anaphylactic shock) and retarded-action, mechanism of their development

4. Task for independent work during preparation to employment

4.1. List of basic terms, parameters, descriptions which a student must master at preparation to employment:

Term	Determination
Primary medicinal firmness (resistant)	It is firmness, which found out for first found out patients which never accepted ATP.
Second medicinal firmness (purchased)	Resistant of MBT, which found out at patients which accepted PTP more than 4 weeks.
Nonresistant	Firmness of MBT against 1 from 5 preparations of I 1-th of row
The field resistant	Firmness of MBT against 2 and anymore drugs.
Multiresistant	It is a variety of polyresistant, namely is firmness of exciter only against combination isoniasidum + rifampicinum or and next to other preparations.

4.2. Theoretical questions are to employment:

1. What methods for detection of Mycobacterium tuberculosis do you know?
2. What is the resistance of Mycobacterium tuberculosis?
3. What kind of resistance do you know?
4. Bacterioscopic method for detecting Mycobacterium tuberculosis.
5. Bacteriological method for detecting Mycobacterium tuberculosis.
6. What changes in blood are the most characteristic of tuberculosis?
7. What are the histological features of tuberculosis?

4.3. Practical works (task) which execute on employment:

Initial level

1. What component connections of MBT are the basic transmitters antigen properties?
   A. Protein.
   B. Carbonhydrates.
   C. Lipidi.
   D. Polysaccharidess.
   E. Mineral salts.
2. What MBT does name a L-form?
   A. Vaccin culture of MBT.
   B. Granular forms of MBT.
   C. Atipic MBT.
   D. MBT, which lost a cellular wall partly.
   E. Filtration forms of MBT
3. What reason of origin of primary medicinal firmness of MBT?
   A. Late exposure of tuberculosis.
   B. Pizne exposure of tuberculosis.
   C. Irregularly reception of antimicobacterial preparations.
   D. Treatment of antimicobacterial the understated doses.
   E. Infection by the proof cultures of MBT.
4. What is primary medical firmness of MBT?

A. Resistant' MBT for first found out patients which did not yet treat oneself
by ABP.
B. Resistant MBT for patients with the primary form of tuberculosis.
C. Resistant MBT for patients with the chronic forms of tuberculosis.
D. Patients have firmness of MBT with the relapses of tuberculosis.
E. Resistant MBT for patients with the small forms of white plague.

5. What from the types of MBT is more pathogenic for a man?
A. M. of africanиm.
B. M. of avium.
C. M. of Evis.
D. M. of tuberculosis humanum.
E. M. of Kansasii.

6. With the purpose of exposure of MBT it was done a patient sowing of sputum on a growth medium. What does testify appearance of colony to on a 3th day of sowing?
A. Growth MBT which propagate oneself quickly.
B. Growth highly virulent MBT.
C. Growth atypical MBT.
D. Growth of heterospecific microbial flora.
E. Growth L-form of MBT.

7. There is what sputum more characteristic for patients with a TB lungs?
A. Mucous festering, odourless, 10-50 ml on days.
B. Purulent with a strong unpleasant smell, ferruginous color, to 500 ml.
C. Purulent odourless, to 300 ml.
D. Mucus 50-100 ml.
E. Purulent-bloody with an unpleasant smell, 100-150 ml on days.

8. Are there what terms of appearance of growth of MBT on growth medium
A. 2-3 days
B. 3-7 days
C. 3-8 weeks
D. 3-5 month .
E. 6 month

9. What type of pathogen is attributed to atypical MBT?
A. M. OF BOVIS
B. M. of africanum.
C. Filtration forms.
D. M. of avium.
E. M. is a human type.

10. WHAT does represent an acceleration settling of red corpuscles?
A. CHANGE forms of red corpuscles
B. Present intoxications
C. Thickening of blood
D. Dilution of blood

11. What term is needed for the exposure of MBT a cultural method?
A. 1 day
B. 7 days
C. 3-8 weeks
D. 3 months

Theme contents:

LABORATORY METHODS OF DIAGNOSTICS

Global analysis of blood. At the early «small» forms of TB haemogram is without pathological changes. Violation of processes of exchange in the organism of patient on TB is reason of changes in blood. Usually such patients in blood have a normal amount of red corpuscles and hemoglobin. To the extent of progress of TB of process the interchange of gases is violated, hyper chromic anemia can develop as a result. Frequent accompany of TB is small leucosytosis (within the limits of 9,0-15,0x10^9/л). A number of leucocytes higher from 15,0x 10^9/l is at caseous pneumonia and in the case of joining of heterospecific inflammatory process. The percent of neutrophyles (within the limits of 6-14%) is increased at the same time, maintenance of lymphocytes diminishes, there can be an eosinopenia, monocytosis. An increase RSE at TB more frequent is within the limits of 25-35 mm/hour, at caseous forms, chronic forms of TB and amyloidosis of internals – to 50-60 mm/hour.

Global analysis of urine. At non complication TB of lungs urinalysis are without pathological changes. At patients with expressed intoxication proteinuria, single red corpuscles and leucocytes can a syndrome appear on a background TB. On a background treatment these changes pass quickly.

Methods of exposure of MBT. A large value in the rightness of implementation of laboratory searches of MBT has a fence of excretions of patient. Tableware in which collect a selection must be sterile. To conduct an inspection in the presence of MBT in material of patient it is needed 3-th multiple, that three days successively a patient hands over a sputum or other biological material.

Select the followings laboratory methods of exposure of MBT: ***bacteriological, bacterioscopical, biological***.

From data of WHO *bacterioscopic method* of exposure of MBT most outage, cheap, specific, accessible as compared to all of other methods of diagnostics of tuberculosis, that is why in today's terms finds the wide use. Bakterioskopic has the varieties: simple backterioscopy, method of flotation and luminescent microscopy.

At stand the backterioscopic of painting are dyed on Tcil-Nilsen: by a glass stick the festerings lumps of sputum are inflicted on subject glass, evenly spread and fix vodka in flame. At first dye carbolic fuccin, which is poured with a remain, warm up again in flame, that MBT better perceived a paint, an extra paint is united and wash in water, then 5% discolor by solution of sulphuric acid or ethyl spirit, whether 3% by muriatic acid to these solutions of MBT proof and does not lose the rose paint of fuccin, and other pathogenic microbes are bleachable. A stroke is again washed in running water, dry out and paint a methyl dark blue, whereupon again wash and dry out. Preparation is studied through immerse system of microscope. For this purpose on a stroke inflict the drop of olive or castor oil, to create a homogeneous environment between a lens and preparation.

MBT under a microscope have the appearance of oblong sticks, rose color on a dark blue background. On painting 20-30 min. is expended.. Method stand and cheap, but little informing, to find out MBT there must be about 100 thousand of MBT in 1 cm^3 of sputum, if it will be less than, MBT will not be found.

For the increase of informing of this method utilize enriching of MBT in 1 cm^3 B is added by liquids with different specific gravity (solution of meadows and csilol and benzol). A liquid with less specific gravity emerges and lifts after itself MBT. Presence

of MBT at this method also discover painting on Tcil-Nilsen. It will be discovered the method of flotation of MBT on 10-15% more frequent, than stand by a backterioscopy.

Yet more informing method of exposure of MBT it is a luminescent microscopy. Luminescence's of MBT, which ate up luminescent sensitively matters (auramin, rodamin) which shine in ultraviolet rays, are fixed in basis of method. A method is more sensible from stand backterioscopies on 10-15%, and on 8% comparatively with the method of flotation.

At *a bacteriologic examination* material of patient is sown on nourishing environments and select the culture of MBT in a clean kind. Advantages of this method are in that at presence of wretched amount of viable MBT in pathological material, excreting MBT diagnosed. The lack of method is slow growth of MBT (from 3-th weeks to the 2-th months). Most often utilize following nourishing environments: Petronyani, Levenshteyn-Yensen, Gelberg, Finn-2, and Shkolnikova. Before sowing on nourishing environments conduct previous treatment of pathological material for elimination of concomitant flora. Select the followings methods of treatment: Mazura, Petrova. On the method of Mazura in a sterile test tube pour 3-4 ml. 2% to solution of sulphuric acid, there place pathological material. Test tube of jolting during 3 min., it is whereupon done a sterile plastic loop occupied on nourishing environments. On the method of Petrova pathological material is inundated by 4% by solution of caustic sodium and put in a thermostat on 1 hour, whereupon well-educated homogeneous mixture is neutralized by 4% by solution of muriatic acid. Sediment of neutral liquid is sown on nourishing environments.

The colonies of MBT on the spot nourishing environment are located stratiform, by scythes, have a smooth surface, color of ivory.

Together bacterioscopic do with a bacteriologic examination.

At discovered clean culture of MBT probe the sensitiveness of MBT to ant mycobacterial preparations (ABP).

Primary medicinal firmness is firmness, which found out for first found out patients which never accepted ATP.

The second medicinal firmness is resistant of MBT, which found out at patients which accepted ATP more than 4 weeks.

Monorezistant is firmness of MBT against 1 from 5 preparations of I-th of row.

Polyresistant is firmness of MBT against 2 and anymore ATP.

Multirezistant is the variety of polyresistant, namely is firmness of exciter only against combination isoniasidum + rifampicinum.

The biological method of exposure of MBT most informing. At this method pathological material of patient is directly entered in an inguinal area of animal (to the crawls, marine pigs). At presence of in pathogenic material of patient of virulent cultures of MBT of animal illness on tuberculosis and die in 1-2 months after a disease. Tuberculosis it is diagnosed after the section of animal, macroscopic diagnostic of humps on abdomen and other organs and microscopic exposure of MBT in pathological material.

For etiologic authentication TB on this time apply also *molecular genetic and immunological methods* the results of which can be got in 3-4 hours. In connection with the high cost of diagnostic and absence of necessary equipment, these methods are rarely utilized in practical medical establishments.

Materials are for self-control:

A. Task for self-control (tables, charts, pictures, graphic arts):

B. Task for self-control

1. A patient is 37 years. Appealed to the internist with complaints about a cough with the selection of sputum during 3-4 weeks, increase of temperature to 37, 2-37, 3°C. Objectively are without pathology.

What inspection is appointed for establishment of diagnosis of tuberculosis?

2. The patient of 45 years entered neurological separation with complaints about sharp pain in the lumbar department of spine, cough with the selection of sputum during 2th months.

What inspection does need to be appointed a patient for the exception of tuberculosis?

3. The patient of 30-ти years during 2th months marked the increase of temperature to 37,1°-37,3°C decline of appetite, enhanceable fatigueability, nightly пітливість. Practises upon an alcohol. Objectively: mionectic feed; above lungs hearkened to the hard breathing. Blood test: L-9,5kh109 of /л, SHOE-27 of мм/год. X-ray: in the overhead and middle departments of lungs plural focal shades are determined by a size from 3 to 8 mm, small and middle intensity. In a patient suspected dissemination TB.

What clinical syndromes found out for a patient?

4. Patient 48 years. During 2th months was on treatment in a therapeutic separation concerning bilateral pneumonia. Treatment was ineffective. In anamnesis diabetes and ulcerous illness of 12-falling bowel.

What laboratory research is need to sick?

Literature

Basis:

1. Phthisiology : a teaching manual / B.F. Moskalenko, V.I. Petrenko, G.O. Timoshenko – Kiev: Medicina, 2012. – 216 p.
2. Phthisiology : textbook / V.I. Petrenko, O.K. Asmolov, M.G. Boyko [et al.] ; edited by V.I. Petrenko. – Kiev : AUS Medicine Publishing, 2015. – 416 p.

Supplementary

1. Tuberculosis : manuel for teacher, students and doctors / A.G. Yareshko, M.V. Kulish. – Poltava : Poltava Literator, 2011. – 156 p.

Information resources

1. Childhood TB for Healthcare Workers: an Online Course. – Access mode: https://childhoodtb.theunion.org/courses/en
2. WHO: tuberculosis. – Access mode: http://www.who.int/tb/en/