Topic 1.10 part 2. «Safety provision for the first aid»

Basic cardiopulmonary resuscitation.

Clinical death – is the period from cardiac arrest till irreversible changes in brain-cortex onset. Duration of clinical death is about 3-5 minutes (it depends on some external factors and initial health of the organism).

Resuscitation is a complex of emergency measures taken to revive and restore vital functions of the organism.

Basic cardiopulmonary resuscitation (CPR) includes artificial pulmonary ventilation and external chest compression.

Basic CPR is performed without any special equipment and drugs.

Traditional and long-time existing algorithm of CPR is A-B-C scheme (alphabet of CPR), offered by Peter Safar.

A – airways open – restoration of airway patency;

B – breath for victim – artificial lung ventilation (rescue breathing);

C – circulation of blood – circulation maintenance;

D – drugs and fluids – drugs administration;

E - electrocardiography diagnosis;

F - fibrillation treatment ;

G - gauging – patient assessment and identification heart arrest causes;

H - human mentation – consciousness recovery management;

I - intensive care.

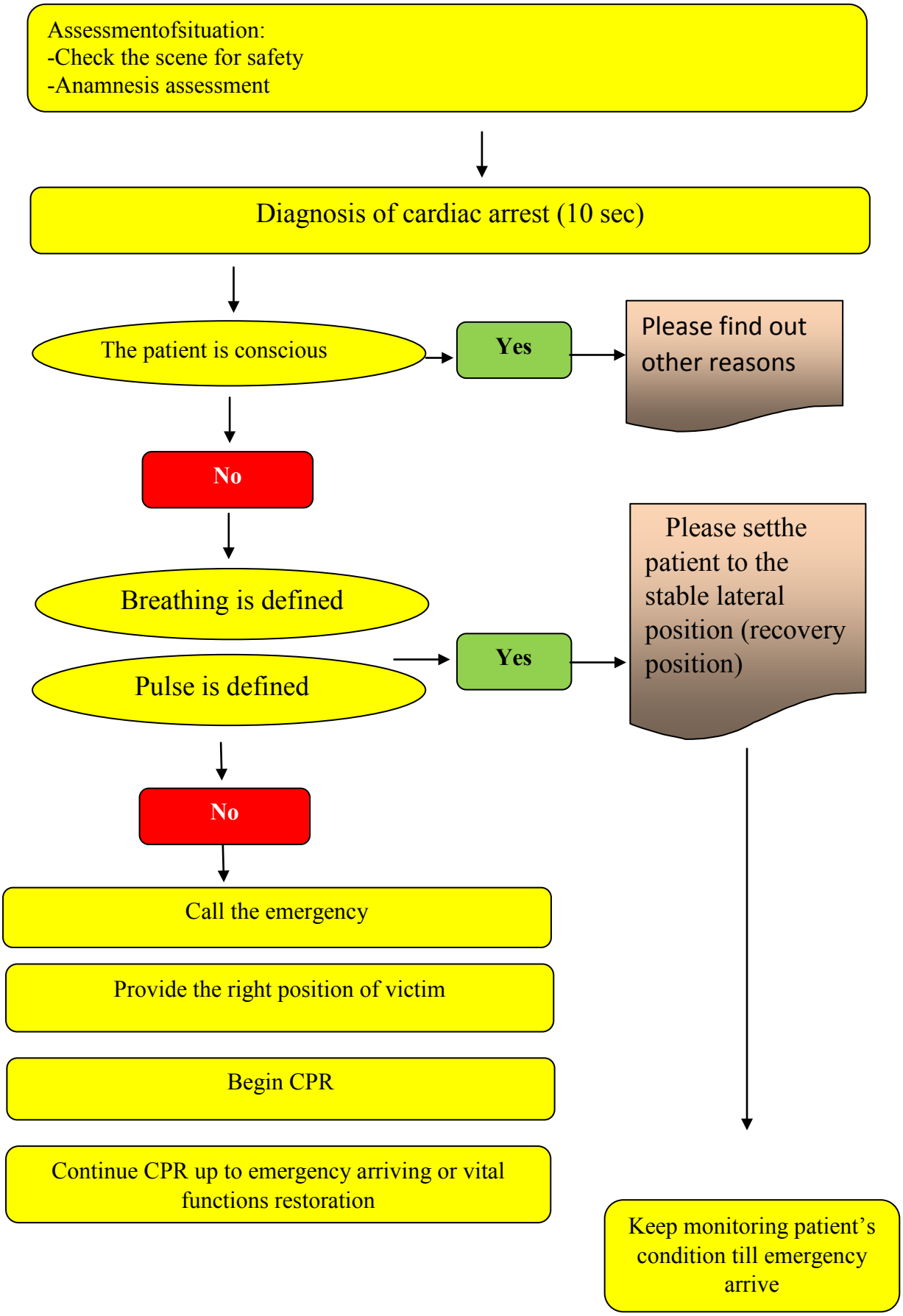
Since 2005 the sequence of resuscitation procedures has been changed from A-B-C to C-A-B. So, we ought to begin the first aid for cardiac arrest from restoration of blood circulation. (C)

Main points of up-to-date CPR:

- Immediate beginning of all CPR arrangements;
- Early using of fibrillatory in the case of fibrillation and ventricular tachycardia without pulse;

- The priority of indirect cardiac massage than lung ventilation;
- Minimization of pauses during indirect cardiac massage;
- Inadmissibility of hyperventilation;

The steps sequence of CPR:



In the case the independent breathing returns →

Diagnosis of cardiac arrest

The main symptoms of cardiac arrest are:

- The absence of consciousness;
- The absence of breathing or pathology breathing without adequate pulmonary ventilation;
- The absence of carotid pulse.

Additional symptoms of cardiac arrest:

- Pupillary dilatation without response to light;
- Skin color changing (pallor, cyanosis);
- The absence of blood pressure;
- The absence of heart tones.

Assessment of consciousness

- Ask the casualty: “What happened? Are you okay?”;
- Give a little shake to the patient holding him for the shoulders;
- If there is no answer - patient is unconsciousness.

Assessment of independent breathing (I hear-I see-I feel)

- Put your ear above patient’s nose and mouth, place your hand on patient’s sternum (lower part);
- Assess chest excursion: inhalation and exhalation movements (I see) and assess sound of exhaled gas (I hear) and assess feelings of chest excursion under your palm (I feel);
- Restore airways patency if there is such need;
- Try to spend not more than 10 sec on breathing and circulation assessment.

In case there is no breathing or there is a pathology breathing or sharp bradypnea it is necessary to start resuscitation immediately.

Assessment of blood circulation

Define pulse on carotid artery (put your fingers in the fossa between thyroid cartilage and muscle roll of sternocleidomastiodeus).

Carry out pulse assessment no longer than 10 sec.

In case there is no pulse on carotid artery begin CPR.

Before performing CPR, it is necessary to maintain conditions for successful results:

Lay down the patient on hard and smooth surface, straight his arms along the body.

Turn the victim as “a whole”, try not to allow displacements of different parts of the body.

Undo the belt and unfasten upper garments.

If there are no contraindications lift patient’s legs.

External chest compressions (close cardiac massage)

In case there is no circulation it is necessary to start external chest compressions.

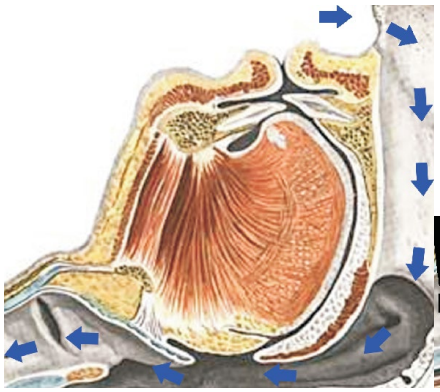
Pic. 1

- Point the heel of your hand at the border of lower and middle parts of sternum right in the midline. Put the heel of your other hand on top of the first. You may interlock your fingers.
- Shoulders and forearms of rescuer are strictly perpendicular to casualty's corpus. Keep your elbows straight all the time.
- Depth of pushing the sternum shouldn't be less than 5 sm., but not more than 6 cm.
- Use your weight and the strength of your back muscles during compressions.
- Thoracic cage must completely straighten after each compression. Don't lift your hands while decompressions!
- Duration of compressions and decompressions of thoracic cage should be equal.
- Frequency of compressions should be no less than 100 per minute and no more than 120 per minute.

External chest compression (close cardiac massage) for infants and children.

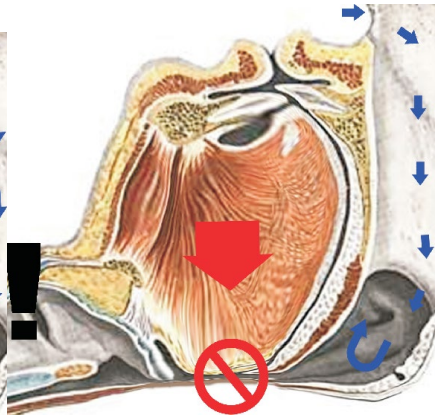
- Frequency of compressions should be the same as for adults (100-120 per minute) independently of their age.
- Newborn to 1 year: use to 2 fingers(second and third or two thumbs) for compression, position – on the center of infant's breastbone just below the nipple line.
- Depth of compressions – 4 cm.
- Age from 1 till 8: use the heel of your one hand.
- Depth of compressions: 5-6 cm.

Restoration of upper airway patency



Pic. 2

Patency of airways



Pic. 3

Airways obstruction (Falling back of the tongue)

Pic. 4

Pic. 5

The most common reason of airways obstruction is falling back of the tongue. Other possible reasons: foreign bodies or obstruction with vomiting matters.

Algorithm of the head tilt-chin lift maneuver:

- Tilt the head and open the airway.
- Press down on the forehead with one hand and lift the chin up with the index and middle fingers of the other hand (be careful if cervical injury is suspected).

- Open the victim's mouth and look for the objects, if you see something in the mouth remove it with a finger sweep, if you do not see the object do not perform a blind finger sweep.
- If you suspect a cervical spine issue use Safar maneuver – a jaw thrust. Use this method when you want to immobilize the patient's head still opening the airway so they can ventilate.
- Stabilize the patient's head with your hands, thrust the jaw putting your fingers on mandibular angles, and open patient's mouth using your thumbs.

Artificial lung ventilation

It includes the following techniques "mouth to mouth", "mouth to nose", "mouth to mouth and nose".

Duration of each artificial inhale is 1 sec., use minimal respiratory volume and minimal pressure to see chest excursion. Required respiratory volume is 500-600 ml.

1. Make sure the airway is open and pinch the nose so it closes.
2. Gently raise the chin upwards with two fingers of your other hand.
3. Take a deep breathand exhale into the patient's airway.
4. You should see the chest rise and fall.
5. To get another breath, lift your head and breathe in deeply. Performsteps 1, 2, 3, and 4 again.

Pic. 6

Pic. 7

Exhalation should be full and passive!

If there is no visible chest lifting and you feel resistance, the airway patency isn't enough or there is a respiratory obstruction with foreign body. In this case you should recover airway patency using "head tilt-chin lift" or "jaw thrust" maneuverers.
If it is impossible to carry out "mouth to mouth" rescue breathing (e.g. little infant or severe jaw injury), it is necessary to carry out "mouth to nose" rescue breathing: tilt victim's head with one hand and use the other hand to lift up chin and close mouth. Blow the air into casualty's nostrils tightly catch them with your lips.

NB!
It is necessary to blow the air into carefully and not very fast (during 1 sec.) or it will cause the opening of the esophagus with the air getting into the stomach. In this case don't press the abdomen to prevent the gastric materials entrance to the mouth and aspiration with gastric contents.

NB!
You can hear fast or vice versa rear and loud inspirations after cardiac arrest. This is a pathology breathing, so don't muddle it with normal breathing. If there is a doubt begin CPR, considering this breathing as the absence of breathing.
If it is possible use protective means during rescue breathing, e.g. a piece of gauze or handkerchief.

Artificial lung breathing for infants
For infants from 0 till 1-year use method "mouth to nose". Remember that respiratory volume of newborns is about 30 ml, so use only the volume of your cheeks providing rescue breathing for them
For infants from 1 year and elder use "mouth to mouth" method.

Coordination of chest compressions and rescue breathing

The optimum combination is **30 external chest compressions and 2 inhales.** This combination allows to decline the number of pauses between compressions and reduce the risk of hyperventilation.

If it seems impossible to restore airway patency, perform only chest compressions (frequency is 100-120 per minute) without rescue breathing until emergency team arrive.

CPR requires strength and energy from rescuer, so it is easier to perform it with helpers (to change each other every 2 minutes)

If there are some rescuers, the person providing chest compressions counts their number aloud.

Monitoring procedures:

Assess pulse on carotid artery (during 10 sec.) after 5 rounds of chest compressions and rescue breathing (each 2 minutes of CPR).

If there are 2 rescuers, person who performing rescue breathing take patient's condition under control.

If you find out pulse,stop chest compressions and assess independent breathing.

If there is no independent breathing, continue to perform rescue breathing and check up pulse on carotid artery each 10 inhales.

Assess color of skin (disappearance of the cyanosis) and eye reflexes.

In case of independent breathing recovery but the absence of consciousness - maintain airwaypatency and control breathing and pulse.

Typical mistakes of CPR:

- Late beginning of CPR;
- Incorrect organization of CPR (the absence of leader, incoordination of actions, intervention of bystanders);
- The absence of hard foundation for cardiac massage;
- Duration of poses between cardiac massage and rescue breathing are more than 10 sec.;

- Wrong area for chest compression (compression of xiphoid appendix may cause severe liver injury, lateral displacement of cardiac massage point may cause multiple ribs fractures);
- Incorrect technique of cardiac massage;
- Unregular control of outcome;
- Long pauses between compressions;
- Cessation of chest compressions after ribs fractures. For life saving it is necessary to continue chest compressions despite of it;
- Tiredness of rescuers. It is necessary to change people in time.

Resuscitation is stopped in cases:

- Medical emergency team arrive and take up CPR.
- Unassisted breathing and circulation return.
- The cardiac activity doesn't return for longer than 30 minutes despite of all efforts.
- Recognizable signs of biological death appear (postmortem lividity, "cat's eye" symptom, rigor mortis).

Resuscitation is not performed in the following cases:

- With recognizable signs of biological death (opacity of eye cornea, symptom of "cat's eye", postmortem lividity and rigidity);
- In case of clinical death in terminal stage of incurable diseases or irreversible injury;
- If the victim comes to normal breathing the resuscitation to be stopped and the victim should be set in a stable lateral position and monitored till the medical emergency team arrived.

NB! You should keep monitoring patient's condition and be ready to restart CPR.

How to set in a stable lateral (recovery) position.

In case the victim is unconscious, but he has independent breathing and detectable pulse it is necessary to set him in a stable lateral position (recovery position).

- Kneel on the floor to one side of the person;
- Place the victim's arm that is nearest to you at a right angle to his body, so it is bent at the elbow with the hand pointing upwards;
- Gently pick up the other hand with your palm against his and place the back of his hand under his opposite cheek, keep your hand there to support victim's head as you roll him (Pic. 9);
- Use your other hand to reach across to the victim's knee that is farthest from you and pull it up until his leg is bent and his foot is flat on the floor (Pic. 10);
- Pull victim's knee towards you with your hand still on the victim's knee, so victim roll over onto his side facing you (Pic. 11);
- Move victim's bent leg that is nearest to you away from his body so that it is resting on the floor;
- Check that nothing is blocking airway, examine pulse and breathing once more.

Pic. 8

Pic. 9

Pic. 10

Pic. 11

Honorable students! After learning this material, you need to pass the test in Google-form. Please fill all gaps properly (name, faculty, number of your group).

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