MINISTRY OF EDUCATION AND SCIENCE KYRGYZ REPUBLIC

OSH STATE UNIVERSITY

INTERNATIONAL MEDICAL FACULTY
DEPARTMENT OF CLINICAL DISCIPLINES 2

A. E. Omurzakova, M. M. Bugubaeva, L. M. Dzhumaeva, V. D. Tursunova, Zh. A. Abdirasulova

PRIMARY RESUSCITATION OF THE NEWBORN

Methodical handbook for students of medical institutions, clinical residents and doctors

Osh, 2020

UDC: 616-053.2
LBC: 57.3
P75

Approved and recommended for publication by the decision of Academic Council of Osh State University, Protocol No. 10, dated June 30, 2020.

Reviewers:

1. Djolbunova Z. K., d.m.s., professor, head of the department of Child Infection Diseases of the KSMA named by I. K. Akhunbaev;
2. Kenzhebaeva G.K., c.m.s., chief physician of the Osh Regional Maternity Hospital.

P75 Primary resuscitation to newborn/ candidate of medical science, associate professor M. M. Bugubaeva, PhD L. M. Dzhumaeva, graduate students A. E. Omurzakova, V. D. Tursunova, Zh. A. Abdirasulova. – Osh 2021.-57p.

ISBN 978-9967-18-648-4

The methodological recommendations set out practical recommendations for providing primary resuscitation to newborns in accordance with the principles of ABCD- resuscitation and clinical protocols on neonatology approved by the Ministry of Health of the Kyrgyz Republic No. 104 dated February 10, 2016, taking into account the recommendations of the AAP and ACA.

The guidelines are designed for practitioners of public health, clinical residents and university students to improve the development of practical skills using simulation equipment.

ISBN 978-9967-18-648-4

UDC: 616-053.2
LBC: 57.3

TERMINOLOGICAL DICTIONARY

AAP	American academy of pediatrician
ACA	American cardiology association
MVV	Minute ventilation volume
RDS	Respiratory distress syndrome
ICU	Intensive care unit
HR	Heart rate
PEEP	Positive end- expiratory pressure positive pressure at the end of exhalation
PIP	Peak inspiratory pressure
ET	Endotracheal tube
CPAP	Continuous positive airway –continuous positive airway pressure
SV	Stroke volume
BR	Breathing rate
ABC	Airway (respiratory tract), Breathing (respiration), with Circulation (blood circulation) resuscitation algorithm
CBV	Circulating blood volume
ICUN	Intensive care unit for newborns
MV	Mechanical ventilation
AV	Assisted ventilation
Pa CO2	Partial pressure of CO2 in the alveolar air
Pa O2	Partial pressure of O2 in the alveolar air
PaCO2	Partial pressure of CO2 in arterial blood
PaO2	Partial pressure of O2 in arterial blood
CVC	Central venous catheter
MVV	Minute volume of ventilation

INTRODUCTION

Having a baby is a complex and in some cases unsafe process. Severe ante- and intranatal fetal hypoxia is one of the main causes of high perinatal morbidity and mortality in the Kyrgyz Republic. Effective primary resuscitation of newborns in the delivery rooms can significantly reduce the adverse effects of perinatal hypoxia. More than 90% of babies are born easily, with little external support or completely independently. About 10% of all newborns need any measures to start spontaneous breathing after birth. Less than 1% of infants need advanced resuscitation steps [5]. And to help those few percent of newborns, who needs additional intervention, a newborn resuscitation program has been created. Despite the fact that the proportion of newborns in need of resuscitation is not huge, their absolute number is significant due to the big number of births. The consequences of not providing resuscitation care to a newborn can be fatal or lead to problems that continue throughout a person's life. Over the past time, both in our country and abroad, great clinical experience has been accumulated in the primary resuscitation of newborns of different gestational age, the generalization of which made it possible to identify reserves for increasing the effectiveness of both individual medical measures and the entire primary resuscitation complex as a whole. However, it is also very important to properly provide resuscitation care. According to various estimates, from 0.5 to 2% of full-term babies and from 10 to 20% of premature and premature babies need primary resuscitation measures in the maternity ward. Moreover, the need for primary resuscitation in children born with a body weight of 1000-1500 gr. is from 25 to 50% of children, and in children weighing less than 1000 g - from 50 to 80% or more [10].

Effective primary resuscitation of the newborn in the delivery room can significantly reduce the adverse effects of perinatal hypoxia. The past time, both in our country and abroad, has gained great clinical experience in the primary resuscitation of newborns of different gestational age, the generalization of which allowed us to identify reserves for increasing the effectiveness of both individual medical measures and the entire primary resuscitation complex as a whole. Thus,

these recommendations set forth modern, internationally recognized and tested in practice principles and algorithms for the primary resuscitation of newborns.

Thus, these recommendations set forth modern, internationally recognized and tested in practice principles and algorithms for the primary resuscitation of newborns. But for their full-scale introduction into medical practice and maintaining a high level of quality of medical care for newborns, it is necessary to organize training of medical workers on an ongoing basis in each obstetric hospital. The early implementation of updated approaches to primary and resuscitation care for newborns will reduce neonatal and infant mortality and disability since childhood, and improve the quality of medical care for newborns [10].

The purpose of the lesson:

Able to apply the knowledge gained in practical classes on primary resuscitation and intensive care of newborns born in asphyxia; learn to diagnose other pathological conditions in the newborn, determine the therapeutic tactics depending on the specific clinical situation, evaluate the effectiveness of the treatment.

The list of basic concepts that a student should master in the specified lesson:

1. Anatomical-physiological features of the fetus and newborn;
2. Restructuring of the respiratory and cardiovascular systems after the birth of a child;
3. Pathogenetic aspects and clinical manifestations of various pathological conditions neonates requiring intensive care and resuscitation;
4. Mechanism of the first breath;
5. Etiology and pathogenesis of asphyxia;
6. Tools and equipment required for the provision of primary resuscitation care;

7. Assessment of the condition of the newborn on the Apgar scale;
8. The basic principles of resuscitation and intensive care of newborns born in asphyxia, as well as other pathological conditions (respiratory distress syndrome type 1, meconium aspiration, mother-to-child syndrome with diabetes mellitus).

The list of skills that a student should acquire:

1. Correctly evaluate the clinical picture of various pathological conditions of the neonatal period;
2. Determine the indications for primary resuscitation of the newborn with asphyxiation of varying severity (Apgar scale) and the amount of assistance provided ;
3. Principles of rendering assistance to newborns born in asphyxiation, in accordance with the positions of ABC resuscitation;
4. Technique for releasing the newborn's airways;
5. The technique of staging the same probe;
6. Technician for staging an umbilical catheter;
7. The technique of mask ventilation and errors in its improper implementation;
8. Technique for intubation of the trachea;
9. Signs of correct and incorrect insertion of the endotracheal tube;
10. Technique of indirect massage of heart;
11. Drug therapy for primary resuscitation of newborns;
12. Evaluate the effectiveness of therapy using virtual monitoring.

CHANGE FROM THE RESPIRATORY AND CARDIOVASCULAR SYSTEMS AFTER BIRTH OF A BORN

Before birth, oxygen, which is used by the fetal body, diffuses through the placental membranes from the mother's blood to the fetal blood, and only a small part of the fetal blood passes through its lungs. The latter do not function as a source of oxygen or an organ for the release of carbon dioxide, so blood perfusion for fetal lungs is less important. In the uterus, the fetal lungs increase in volume, but the potential air sacs in the lungs (alveoli) are filled with liquid rather than air (Fig. 1).

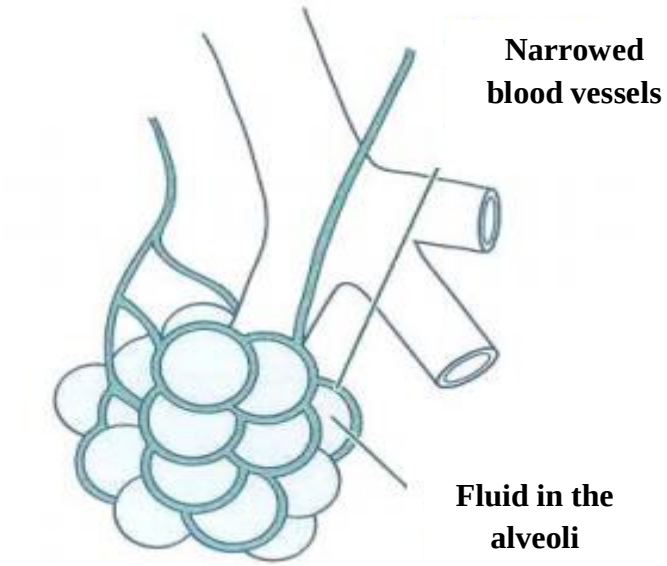


Fig. 1. **Fluid-filled alveoli and narrowed vessels before birth.**

After birth, the baby is no longer associated with the placenta and is already dependent on the lungs as the only source of oxygen. In this regard, it is necessary that in the first seconds after birth, the lungs are filled with oxygen, the pulmonary vessels dilate to ensure perfusion of the alveoli and oxygen absorption, followed by its delivery with blood to all organs and tissues of the body. Alveolar fluid is absorbed into the lung tissue, and the alveoli are filled with air. Oxygen diffuses into the blood vessels surrounding the alveoli. After clamping the arteries and the vein of the umbilical cord, the placental vascular blood flow, which has a low

resistance, is separated from the bloodstream of the child, which increases systemic blood pressure. Due to gas expansion of the lungs and an increase in oxygen concentration in the alveoli, the blood vessels of the lung tissue expand. This expansion, together with an increase in systemic blood pressure, leads to a sharp increase in pulmonary blood flow and a decrease in blood flow through the arterial duct. Oxygen from the alveoli is absorbed due to increased pulmonary perfusion, and oxygen-enriched blood returns to the left heart, from where it goes to the tissues of the newborn. With an increase in the level of oxygen in the blood and the expansion of the blood vessels of the lungs, the arterial duct begins to narrow. Blood, which used to pass through the arterial duct to the aorta, now goes to the lungs, captures most of the oxygen in them and provides them with all tissues and organs (Fig. 2).

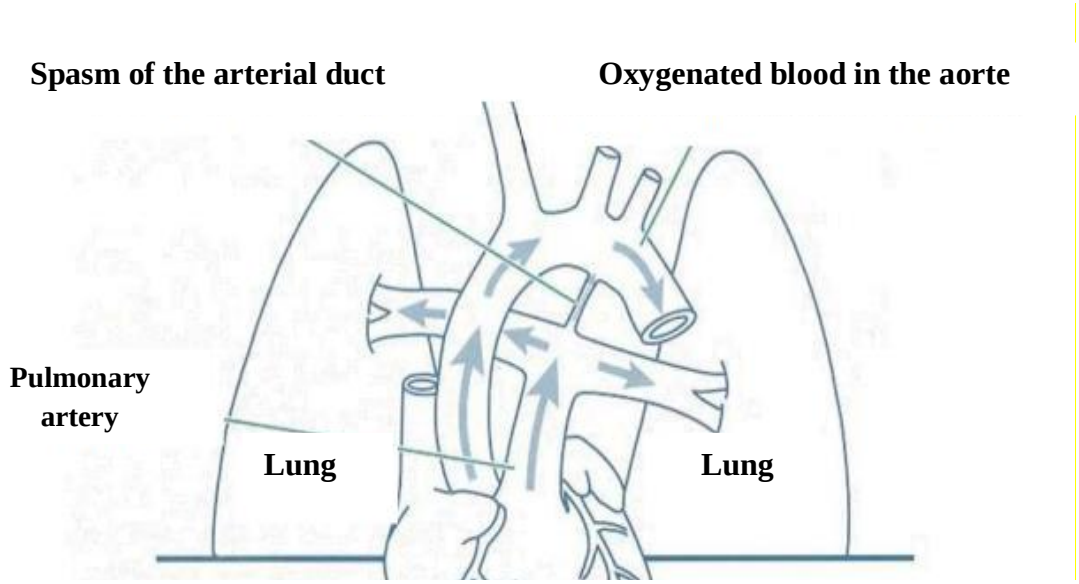


Fig.2 **Restructuring of the respiratory and cardiovascular systems after the baby is born.**

Thus, at the end of the period of early physiological adaptation, the newborn breathes air and receives oxygen as a result of the functioning of his own lungs. His first cry and breath should be strong enough so that the pulmonary fluid

extrudes from the airways. As soon as enough oxygen enters the baby's blood, his cyanotic skin turns pink.

ASPHYXIA OF THE NEWBORNS

Classification:

Moderate neonatal asphyxia - spontaneous breathing is irregular or absent, heart rate is normal (heart rate> 100 beats / min), muscle tone is relatively good, the skin is cyanotic.

Severe neonatal asphyxia - spontaneous breathing irregular or absent, heart rate <100 beats / min or absent, low muscle tone, skin integument cyanotic or pale.

This classification applies only in the first hours after birth!

Pathogenesis of asphyxia of the newborns.

The first clinical sign of fetal impairment due to asphyxia, which is associated with both the antenatal and intranatal periods, is a decrease in heart rate, which is caused by a violation of blood flow in the placenta or umbilical cord. Problems that occur after birth are more often associated with the respiratory tract of the baby. They are as follows:

1. The child does not breathe vigorously enough, which does not allow to displace the pulmonary fluid or meconium from the alveoli and to penetrate the air into the alveoli. As a result, the lungs are not filled with air and oxygen does not penetrate into the blood in the pulmonary circulation.

2. The expected increase in blood pressure does not occur due to significant blood loss, reduced contractile activity of the myocardium or bradycardia as a result of hypoxia.

3. There is a prolonged spasm of pulmonary arterioles due to lack of oxygen or insufficient increase in gas volume of the lungs. These vessels may remain constricted, which interferes with the oxygenation of body tissues (persistent

pulmonary hypertension). Together with persistent spasm of the pulmonary vessels, there will also be a narrowing of the arterioles in the intestines, kidneys, muscles and skin. At the same time, the blood supply to the heart and brain does not initially suffer. This redistribution of blood flow, due to centralization of blood circulation, helps maintain the functions of vital organs. However, if oxygen starvation is prolonged, myocardial function worsens, cardiac output decreases, and blood supply to all organs decreases in the future. Inadequate perfusion and oxygenation of tissues can result in damage to the brain and other organs or death. A child may reveal one or more signs of this condition: cyanosis due to a reduced oxygen content in the blood, bradycardia due to insufficient oxygen delivery to the cardiac muscle or brain; low blood pressure as a result of insufficient oxygen supply to the myocardium, blood loss or insufficient return of blood from the placenta before and / or during childbirth; inhibition of the respiratory reflex due to reduced oxygenation of the brain; decreased muscle tone due to insufficient supply of the brain and muscles with oxygen. The first violation in conditions of oxygen deficiency is respiratory arrest. After frequent attempts to inhale, primary apnea occurs, in which stimulation by wiping the skin or patting in the feet can lead to restoration of breathing. However, if the lack of oxygen persists and the child takes several ineffective breaths, a state of secondary apnea occurs. Tactile stimulation no longer provides spontaneous breathing at this time. To stop the pathological process at this stage, it is necessary to start artificial ventilation of the lungs. The Apgar scale helps to assess the condition of the newborn in the delivery room, according to which the neonatologist can decide whether the child was born with or without asphyxiation.

FACILITIES AND EQUIPMENT FOR PRIMARY RESEARCH AID

For primary resuscitation of newborns, the following equipment and materials are mainly used:

1. Gloves are sterile or clean;

2. Clock – timer;

3. Resuscitation table with heating;
4. Food grade plastic wrap (for preterm infants with a gestational period of less than 29 weeks);
5. O2 source with a flow meter;
6. Pulse oximeter with sensors for newborns;
7. Stethoscope;
8. Electric suction tool or sterile individual pear for suctioning mucus;
9. 250 and 500 ml self-healing breathing bag;
10. Face masks the sizes - 00; 0; 1;
11. Set for intubation: a laryngoscope with straight blades of size 0 - for pre-term and 1- for full-term;
12. Spare bulbs and batteries for a laryngoscope;
13. Meconium aspirator;
14. Aspiration catheters (sizes - 5 Fr , 8 Fr , 10 Fr , 12 Fr , 14 Fr);
15. Endotracheal tubes with a diameter of 2; 2.5; 3.0; 3.5; 4.0;
16. Gastric tube 5 Fr , 8 Fr;
17. Umbilical catheter size 5 Fr , 6 Fr;
18. Syringes 1.0; 2.0; 5.0; 10.0; 20.0 ml;
19. Saline solution of 0.9%;
20. Epinephrine (Adrenaline) 0.1% or 0.18% (store according to instructions);
21. Scissors;
22. Plaster;
23. Resuscitation device/manual ventilator with T-connector, nasal cannulas (if possible).

FACTORS INDICATING THE POSSIBLE NEED FOR RESUSCITATION CARE FOR A NEWBORN IN THE DELIVERY ROOM

Antenatal factors:

- Maternal diabetes;
- Hypertensive disorders during pregnancy;

- Hypertensive disease;
- Chronic pathology of the mother (cardiovascular, neurological, pulmonary, renal);
- Thyroid disease;
- Severe anemia;
- Rh - sensitization;
- A history of fetal or newborn death;
- Bleeding in the II , III trimester;
- Polyhydramnios and low water;
- Premature rupture of amniotic fluid;
- Post-term pregnancy;
- Multiple pregnancy;
- Inconsistency of fetal size with gestational age;
- Drug therapy (magnesium sulfate, adrenergic blockers);
- Mother use of drugs;
- Anomalies in the development of the fetus;
- Decreased fetal activity;
- Lack of antenatal care.

Intranatal factors:

- Emergency cesarean section;
- Forceps delivery or fetal vacuum extraction;
- Breech or other mallpresentation of the fetus;
- Premature birth;
- Induced/precipitate delivery;
- Chorioamnionitis;
- Long waterless period (> 18 hours before delivery)
- Long waterless period(> 24 hours)
- Long waterless period(> 2 hours)
- Fetal bradycardia is the indistinct nature of the fetal heart rate;

- General anesthesia
- Anomalies of labor (discoordination, fast or rapid childbirth);
- Mother's prescription of narcotic drugs 4 hours before birth;
- Meconial amniotic fluid;
- Prolapse of umbilical cord;
- Umbilical cord detachment;
- Placenta previa.

APGAR SCORING SISTEM

Evaluation is carried out by the end of 1 and 5 minutes. If at 5 minutes of life the child receives an Apgar score of less than 6 points, then the assessment should be repeated at 10 minutes of life.

Table1.

	Sign	0	1	2
A	**Activity** (muscle tone)	No reaction	Grimace	Cough
P	**Pulse** (heart rate)	Absent	<100	> = 100
G	**Grimace** (reflex response to nasal catheter insertion)	Absent	Some flexion of the limbs	Active
A	**Appearance** (skin color)	Cyanotic or pale	The body is pink, the limbs are blue	Pink
R	**Respiration** (breath)	Absent	Slow, irregular	Good scream

Evaluation on the Apgar scale is an objective method for quantifying the general condition of the body for ongoing resuscitation measures.

The Apgar rating does not use to determine the need for resuscitation, the types of resuscitation measures and the time they are taken.

A low score by Apgar after 5 minutes is predictive of outcome.

Factors influencing the Apgar score:

1. Gestational age.

2. Mother taking medication.

3. Infection.

4. Neuromuscular disorders

5. Cardiopulmonary pathology at birth.

6. Inconsistency assessment.

PREPARATION OF EQUIPMENT AND FACILITIES IN THE MATERNITY WARD AND IN THE OPERATING ROOM

Before each birth, you need to check the temperature in the delivery room:

- The temperature should not be lower than 25 ° C at the birth of a full-term newborn, - at the birth of a premature newborn not lower than 28 ° C;
- There should be no drafts.

Before delivery in advance:

- turn on the source of radiant heat;
- warm the surface of the resuscitation table to 36-37 ° c;
- prepare warm diapers, hat, blanket, socks;
- prepare and roll a roller under the shoulders from the diaper.

To reorganize the VDP, prepare:

- equipment for suctioning the contents of the upper respiratory tract
- for a full-term newborn, prepare a gastric tube of size 8 fr, for a preterm newborn-5fr;
- 1-time syringe - 20 ml for decompression of gastric contents;
- plaster, scissors.

Prepare equipment for lung ventilation:

- self-fusing bag with a volume of 250-500 ml;

- masks with a soft rim sizes 00, 0 and 1;
- check the functioning of the control valve, the integrity of the bag

Check the air-oxygen mixture supply system:

- the presence of an oxygen source with a flowmeter (oxygen flow meter);
- source of compressed air;
- pressure, flow rate, flow rate of the air-oxygen mixture should be at least 5 l / min;
- the presence of connecting tubes;
- humidifier;
- pulse oximeter with sensors for newborns;
- prepare and test the intubation kit;
- additional measures to maintain body temperature - a plastic film for wrapping (food).

ASSESSMENT OF GENERAL CONDITION AFTER BIRTH

After birth, evaluate the signs of live birth of a newborn:

- umbilical cord ripple;
- breath;
- heartbeat;
- motor activity.

How to evaluate breathing, heart rate and muscle tone?

Breathing score:

Normally, the child has an active excursion of the chest, and the frequency and depth of respiratory movements increase a few seconds after tactile stimulation, the norm is normally 40-60 times per minute. Convulsive respiratory movements (gasping) are ineffective, and their presence in a newborn requires a series of resuscitation measures, as in the complete absence of breathing.

Heart rate assessment:

Heart rate should exceed 100 beats per minute. Heart rate is calculated at the base of the umbilical cord, directly in the area of its attachment to the anterior abdominal wall. If the pulse on the umbilical cord is not detected, you need to listen with a stethoscope to the heartbeat above the left side of the chest. The calculation of heart rate is carried out for 6 seconds and the result is multiplied by 10.

Muscle tone:

After birth, the newborn must perform active muscle movements, the limbs are bent. In children who underwent hypoxia during childbirth and in premature newborns, muscle tone is reduced, limbs are straightened and lethargic.

STAGES OF RESUSCITATION OF NEWBORNS

During childbirth, the need for resuscitation can occur suddenly, so at least one doctor who has skills in resuscitation of newborns and will be responsible for assisting the newborn should be present at each birth. Additional staff (two health workers) is needed during high-risk labor. The developed principles of ABCD resuscitation allow to correctly and consistently carry out all the required stages of intensive care and resuscitation of a newborn born in asphyxiation.

Stage A includes: warming the baby; ensuring the correct position of the head and the release of the airways if necessary (provide for the possibility of intubation of the trachea at this moment); drying the skin and stimulating the baby's breathing; assessment of respiration, heart rate and skin color; oxygen supply if necessary.

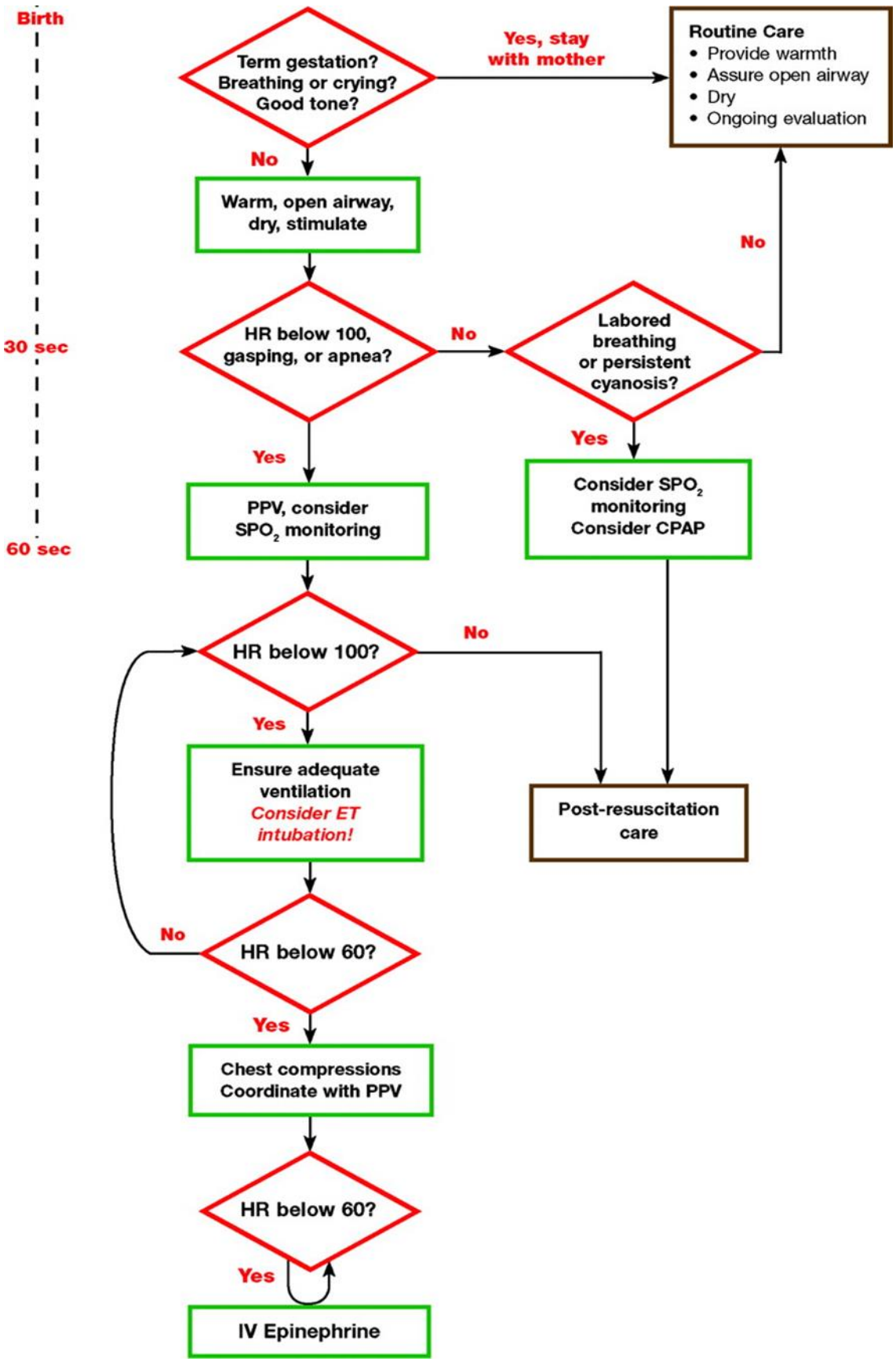
Stage B is to provide auxiliary ventilation of the lungs under positive pressure using a resuscitation bag and 100% oxygen (provide for the possibility of tracheal intubation at this point).

At stage C, an indirect heart massage is performed, continuing auxiliary ventilation (provide for the possibility of tracheal intubation at this moment).

At stage D, adrenaline is administered, continuing auxiliary ventilation and indirect cardiac massage (allow for tracheal intubation at this point). In order for the primary resuscitation to be timely, effective and redundant, the neonatologist-resuscitator needs to evaluate: the child's breathing (screaming, breathing or not breathing); skin color (pink or cyanotic). The presence of spontaneous breathing can be detected by observing the movements of the chest. A loud cry indicates breathing. However, sometimes an inexperienced neonatologist may mistaken breathing such as gasping for effective respiratory efforts. Gaspings are a series of deep single or serial convulsive breaths that occur during hypoxia and/or ischemia. This type of breathing indicates severe neurological or respiratory depression. Gaspings in a newborn usually indicate a serious problem and require the same intervention as a complete lack of breathing (apnea). Skin color that changes from blue to pink in the first few seconds after birth can be a quick visual indicator of effective breathing and blood circulation. The skin color of a child is best determined by examining the central parts of the body. With a significant lack of oxygen in the blood, a blue tint of the lips, tongue and trunk (cyanosis) will be observed. Sometimes central cyanosis can be detected in healthy newborns. However, their color quickly, within a few seconds after birth, should change to pink. Acrocyanosis, which means the blue tint of only the hands and feet, can last longer. Acrocyanosis without central cyanosis, as a rule, does not indicate a low level of oxygen in the blood of the child.

Only central cyanosis requires intervention.

THE ALGORITHM OF RESUSCITATION OF NEWBORNS



PRINCIPLE OF REANIMATION A

The principle of resuscitation **A (airway)** - ensuring airway patency - consists of the following stages:

1. Ensuring the correct position of the child.

2. Airway release.

3. Tactile breathing stimulation.

Ensuring the correct position of the child.

The newborn should be placed on its back, moderately extending its neck and tilting its head back to a position that will bring the back wall of the pharynx, larynx and trachea in one line and will facilitate free access of air (Fig. 3, a). Such alignment is also best for effective ventilation with a bag and mask and / or insertion of an endotracheal tube. To maintain the correct position of the head, it is necessary to put a diaper folded in the form of a roller under the shoulders of the child (Fig. 3, b). 11 Care should be taken and avoid excessive stretching (Fig. 3, c) or bending of the neck (Fig. 3, d), which restricts air flow into the respiratory tract.

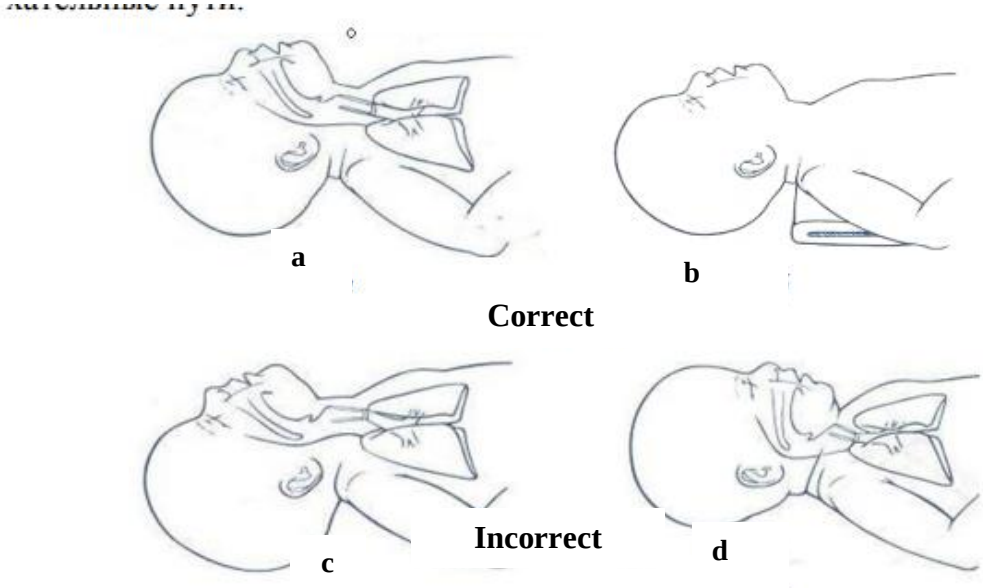


Fig.3. **Correct and incorrect position of the child for carrying out ventilation: a -** moderate neck is stretched; **b -** a diaper is placed under the shoulders; **c -** the neck is stretched excessively; d - the neck is bent unnecessarily.

Airway release. If amniotic fluid was stained with meconium, then after the birth of the child's shoulders, it is necessary to suck out the contents of the opharynx and nose with a catheter or a rubber bulb. The method of further sanitation of the respiratory tract after birth will depend on the presence of meconium and the level of activity of the child. The secret and mucus can be removed from the respiratory tract by cleansing the nose and mouth with a diaper or by sucking the contents with a pear or catheter. If a newborn secretes a lot of secretion from his mouth, his head should be turned to the side. To remove fluid that blocks the airways, you need to use a pear or catheter that is connected to a mechanical suction. First, the oral cavity is sanitized, then the nose, so that the newborn does not aspirate the contents if he takes a convulsive breath during aspiration from the nose.

Tactile breath stimulation. The correct position of the child, suction of mucus often stimulate spontaneous breathing. Wiping, drying the body and head partially perform the same function (first you can put the child on one hygroscopic diaper prepared before resuscitation, which absorbs the bulk of the liquid, then use other warm diapers to continue drying and stimulation **.**

Methods of tactile stimulation of the breath of a newborn. In most children, these steps are sufficient to allow spontaneous breathing. Both drying and suction stimulate the breathing of the newborn, if the child still does not breathe adequately, additional breathing stimulation can be performed. Safe and proper tactile stimulation methods include: patting or tapping on the soles; – light rubbing of the back, trunk or extremities of the newborn (Fig. 4).

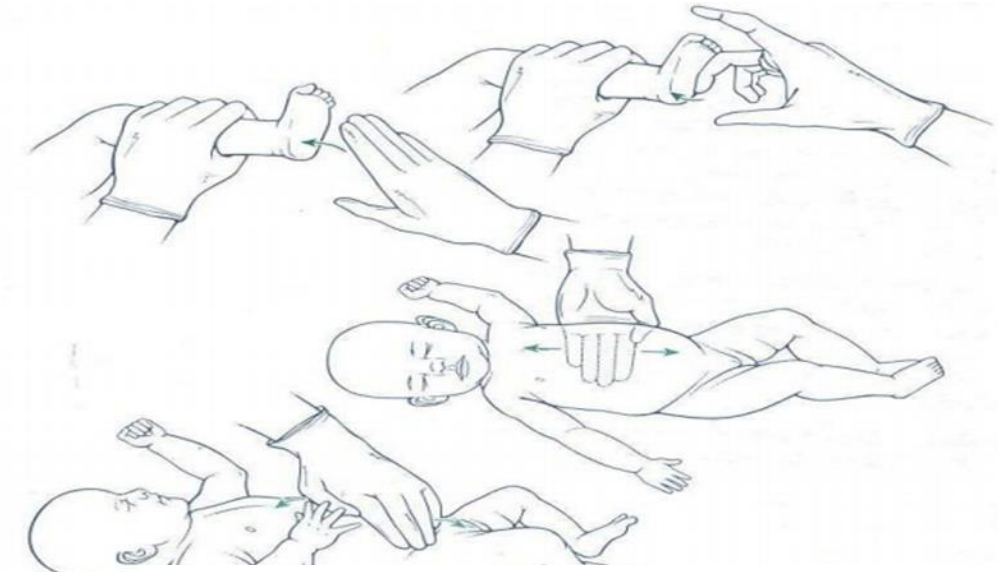


Fig.4. **Methods of tactile stimulation of breathing.**

Table 2.

Prohibited forms of stimulation.

Harmful actions	Potential consequences
Pat on the back or buttocks	Bruises
Chest tightening	Fractures, pneumothorax, respiratory distress, death
Hip pressure on the abdomen	Rupture of the liver or spleen
Use of hot or cold compresses, or baths	Hyperthermia, hypothermia, burns
Shaking	Brain damage
Anal sphincter expansion	Anal sphinctern fissures

If the child is in a state of primary apnea, then stimulation methods can help; if the child has no secondary apnea or rubbing the back should be stimulation will not help. Therefore, one or two clicks or claps in the footsteps is enough. If the child does not breathe, ventilation should begin under positive pressure.

PRINCIPLE OF REANIMATION B

Principle B - ensuring adequate breathing using oxygenation. Oxygen starvation of vital tissues is one of the main causes of the long-term clinical consequences associated with perinatal pathology, therefore it is necessary to ensure adequate breathing in a timely manner. Ventilation is the most important and most effective way of cardiopulmonary resuscitation of a newborn.

For ventilation are used: resuscitation bag; –oxygen tube; –oxygen mask. To achieve the highest possible oxygen concentration, it is necessary to apply a mask or hold the tube as close as possible to the baby's nose (Fig. 5, 6).

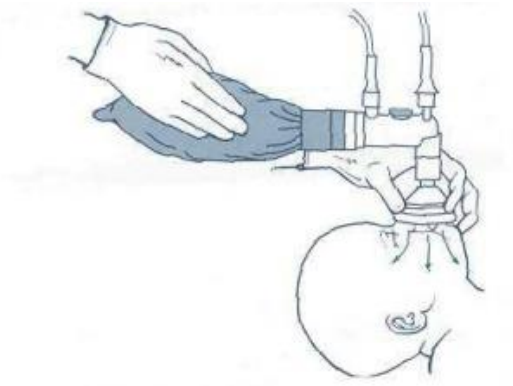


Fig. 5 **Ventilation support.**

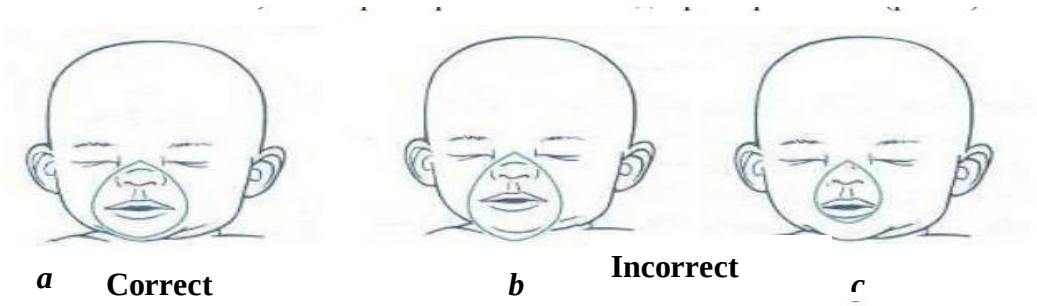


Fig. 6. **Correct and incorrect application of the ventilation mask : a-the mask covers the mouth, nose, and chin, but not the eyes; b-the mask covers the bridge of the nose and protrudes behind the chin (very large); c-the mask does not cover enough of the nose and mouth (too small).**

Visible raising and lowering of the chest are the best signs that the mask is tight and the lungs are oxygenated. Although the lungs need to be ventilated with minimal pressure to ensure adequate chest excursions, the first few breaths of a newborn baby often require high pressure (more than 30 cm water column) to displace fluid from the fetal lungs and fill them with air. Subsequent vents require lower pressure. The ventilation frequency in the initial stages of resuscitation is 40-60 per minute, that is, approximately 1 time per second.

"Target preductal indicators SPO2 newborn after birth"

Table 3.

1 minute	**60-65%**
2 minutes	**65-70%**
3 minutes	**70-75%**
4 minutes	**75-80%**
5 minutes	**80-85%**
10 minutes	**85-95%**

Standard for forced ventilation with bag and mask

Forced ventilation is carried out if:

- there is no breathing or breathing of the "gasping" type (convulsive breathing movements).
- bradycardia (heart rate less than 100 beats per minute), even in the presence of spontaneous breathing.
- persistent central cyanosis or low SPO 2 despite the flow of 100% oxygen in a free flow.

Means for ventilation of the lungs:

A self-fusing bag of Ambu is filled automatically after forced compression; it must have a pressure relief valve with a volume of 250 - 500 ml for newborns. The resuscitation device/manual ventilator with a T-shaped connector, which provides

breathing with flow control and pressure limitation and works only when the respiratory mixture comes from compressed gas sources.

Used masks with a soft rim, size 0 and 1.

Technique for ventilation:

- Before ventilating the lungs, make sure that the breathing bag and mask are properly assembled and working.
- Correct position for ensuring airway patency: position on the back with the head moderately tilted back (cushion under the shoulders).
- Take the correct position near the patient on the side or near the child's head.
- Put on the mask correctly: the mask should tightly fit to the chin, cover the nose and mouth, but not close the eyes.
- Start VVL with a frequency of 40-60 times per minute. To do this, it is necessary to take it out loud, the first few breaths should be carried out under higher pressure than usual.
- Call a second employee for assistance (the assistant attaches a pulse oximeter and monitors heart rate and breathing with a phonendoscope).

"Inhale two …… three …… .. inhale two ……. Three…."

(Squeeze) (release the bag) (squeeze) (release the bag)

Improving the condition of the newborn is characterized by the following symptoms:

- an increase in heart rate;
- improving skin color;
- noticeable symmetrical movements of the chest;
- listening to breathing during auscultation on both sides.

The duration of mask ventilation is determined by the specific clinical situation.

If:

I. Heart rate over 100 beats per 1 minute:

1. If there is adequate independent breathing, stop forced ventilation;

2. In the absence of spontaneous breathing, use the abbreviation MR SODI to correct lung ventilation, first carry out 2 stages (M, P), then the next 2 stages (C, O) and only this, if an adequate chest excursion does not appear, go to the following 2 stages (D, I) see table 4.

Table 4.

Techniques for increasing the effectiveness of forced ventilation of the lungs through a mask (MR SODI).

Correctionsteps		**Actions**
M	The mask requires adjustment	Make sure that the mask is tight against the face
R	Airway Reduction	Reposition the child's head to sniff
S	The sanitation of the oral cavity	Check for discharge in the mouth and nose; sanitize content if necessary
O	Opening a child's mouth	Ventilate the child with an open mouth and a jaw extended forward and upward.
P	Inspiratory pressure needs to be increased	Gradually increase the pressure (every few forced breaths) until listening to pulmonary noises and visible chest excursion with each forced breath
I	Tracheal intubation	Enter ETT or set a laryngeal mask

II. Heart rate from 60 to 100 beats per 1 minute:

1. Continue forced ventilation of the lungs under positive pressure until a stable improvement in the condition of the child.

2. Monitor blood saturation and adjust the oxygen concentration to achieve the target saturation without interrupting resuscitation. See below.

Using a pulse oximeter and supplying additional oxygen

The principle of operation of a pulse oximeter is based on the determination of the color of blood flowing through the capillaries of the skin, oxygen saturation of the blood, and comparing it with reference blood samples.

Indications for use of a pulse oximeter:

- when the likelihood of resuscitation is predicted (based on history).
- when ventilation is longer than a few breaths.
- when central cyanosis persist.
- when additional xyloride is used.
- when you doubt the child has cyanosis.

It is important to correctly place the sensor from the pulse oximeter:

- the sensor should be attached to the wrist or hypotenar region on the right hand.
- wrap the sensor around the wrist, comparable so that the detector can "see" the light source.

When the pulse oximeter is operating reliably, the percentage of oxygen in the inhaled air mixture should be adjusted to achieve the target saturation values.

The fetus has a blood oxygen saturation of 60%, and a healthy newborn may need up to 10 minutes for saturation to reach a normal level (more than 90%).

Additional oxygen at the beginning of resuscitation is not needed. However, if the child has skin cyanosis or a pulse oximeter reading below the expected level, increase the concentration of O2 more than 21% (in the range from 21 to 100%), the flow rate is 5 l/min.

The concentration of O2 in the air mixture should be selected on the basis of pulse oximetry and gas composition of arterial blood.

When using additional O2, when the pulse oximeter data reaches a range of 85% to 90%, gradually reduce the oxygen concentration

3. Enter a gastric tube if lung ventilation continues through the mask.

If ventilation with a bag and mask lasts longer than several minutes, it is additionally necessary to introduce into the stomach and leave a gastric tube in it. This is a mandatory requirement, because during ventilation with a bag and a mask, gas enters the pharynx, from where it freely reaches not only the trachea and lungs, but also the esophagus. Even with the correct position of the head, part of the gas can enter the esophagus and stomach. A stomach stretched with gas presses on the diaphragm, interfering with the full expansion of the lungs. Also, gas in the stomach can cause regurgitation of the gastric contents, which the child can later aspirate during ventilation with a bag and mask. To place a gastric tube, feeding tube and a 20 ml syringe are needed. The length of the inserted probe should be equal to the distance from the nose to the earlobe and from the earlobe to the xiphoid process. This length should be marked on the probe. It is better to enter the probe through the mouth, and not through the nose. The nose should be free for ventilation.(Fig.7).

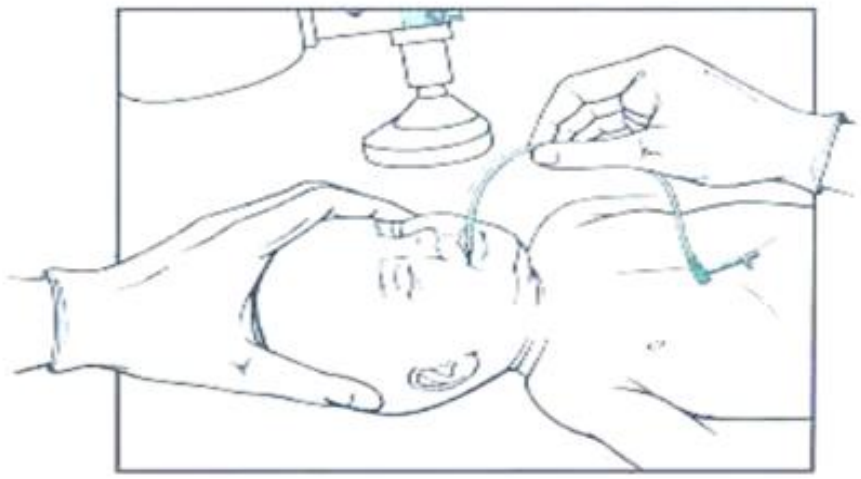


Fig. 7 **Correct placement of the gastric probe.**

4. Reduce inspiratory pressure if filling the lungs with air seems excessive.

5. Throughout the time of forced ventilation, evaluate attempts to perform respiratory movements, heart rate and blood saturation continuously or every 30 seconds.

6. If the heart rate remains at the same level, make sure that the ventilation is effective, exclude pneumothorax or hypovolemia.

7. When the heart rate is stable at more than 100 beats per minute, reduce the frequency of inspirations and inspiratory pressure while observing the appearance of independent inspirations. Ventilation under positive pressure can be stopped when the baby has:

- Stable heart rate of more than 100 beats / min.
- Steady spontaneous breath.

In general, ventilation with a bag and mask is less effective than ventilation through an endotracheal tube, because in the case of using a mask, part of the air enters the stomach through the esophagus. If mask ventilation is ineffective, tracheal intubation will be appropriate.

PRINCIPLE OF REANIMATION C

The principle of resuscitation C (cor) - restoration and stabilization of hemodynamics - includes indirect heart massage and the appointment of cardiotonic therapy.

Indications

- Heart rate less than 60 per min, despite adequate ventilation of the lungs under positive pressure for 30 s.
- Start an indirect heart massage with a frequency of 90 compressions per minute, continue lung ventilation with oxygen at a frequency of 30 breaths per 1 minute and determine whether tracheal intubation is necessary (if it has not been performed previously). If you do not know the technique of intubation, you must first invite a specialist who has the skills for intubation of the trachea.

The heart is located in the chest cavity between the lower third of the sternum and the spine. Pressure on the sternum causes compression of the heart, an increase in intrathoracic pressure and an ejection of blood into the arteries.

Each cycle of indirect heart massage (Fig. 8) consists of a period of pressure on the sternum (compression) and a period of pressure decrease (decompression).

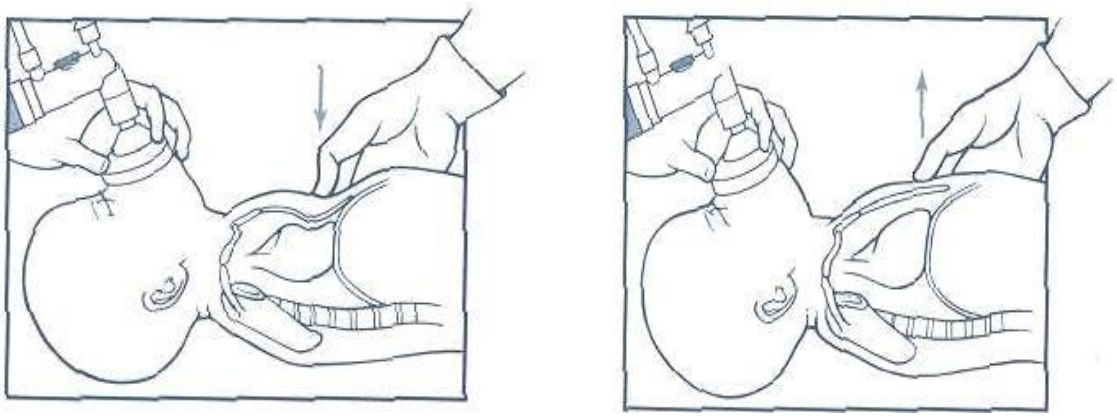


Fig. 8. **Technique of indirect heart massage:**
a - pressure; b –release.

Pressure is applied to the lower third of the sternum, located between the xiphoid process and the line that connects the nipples (Fig. 9). The resuscitator needs to be careful and avoid pressure on the xiphoid process.

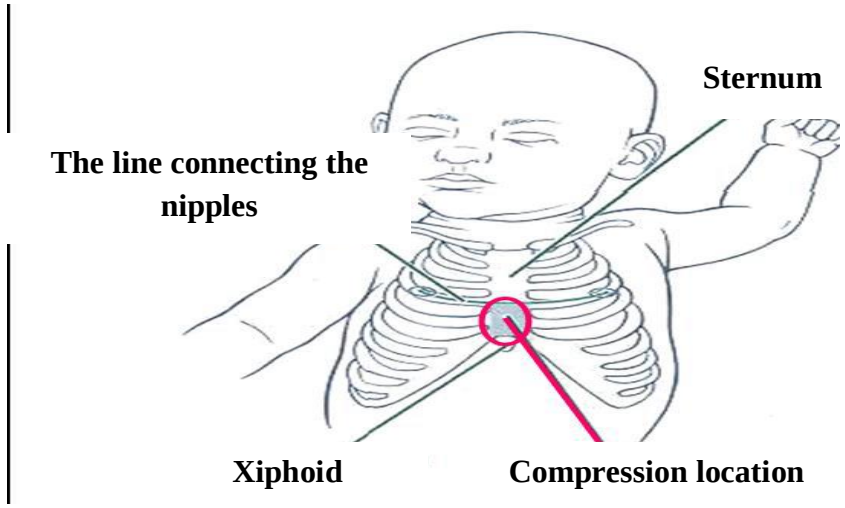
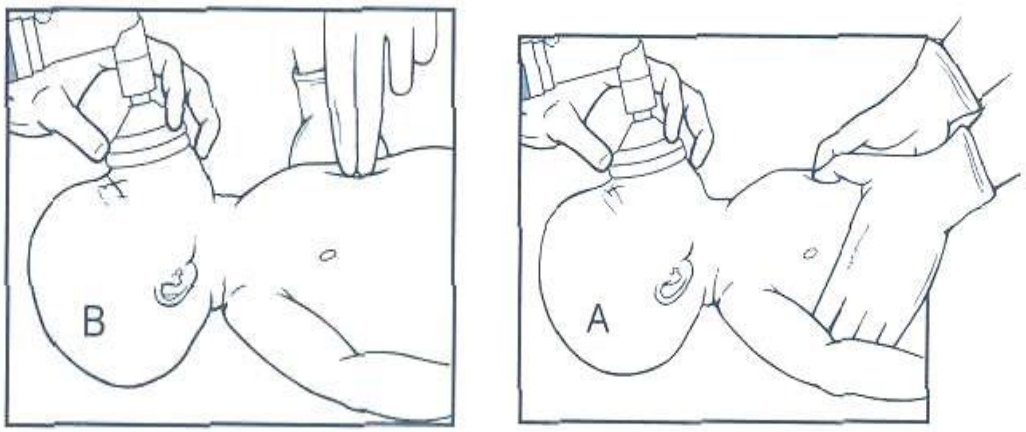


Fig. 9. **Determining the location of compression.**

There are 2 different methods for performing an indirect heart massage:

- the method of the thumbs of both hands, which involves compression of the sternum with the thumbs of both hands, grasping the chest with palms and supporting the spine with fingers (Fig. 9, *a*);

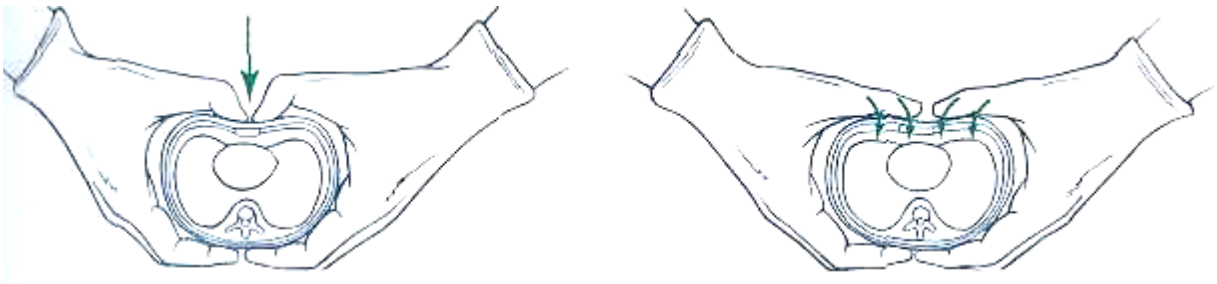
- the method of two fingers of one hand, in which the tips of the middle and index fingers of one hand are pressed on the sternum, and the back of the child is supported with the other hand, unless the newborn is lying on a very hard surface (Fig. 10).



a ***b***

Fig. 10. **Various methods of indirect heart massage:**
a **- thumbs method of both hands;** ***b*** **- the method of two fingers of one hand.**

With the thumbs method, the latter need to be bent in the first joint, and the pressure should be directed vertically to compress the heart between the sternum and the spine. This position allows you to avoid mistakes when conducting indirect heart massage (Fig. 11).



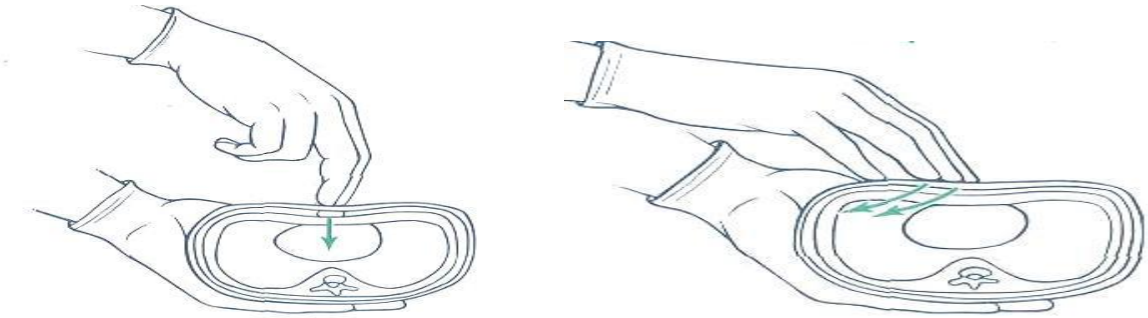
Right **Wrong**

a **b**

Fig. 11. **Right and wrong tapping with the thumbs method:**
a **- pressing the sternum;** ***b*** **- lateral pressing.**

In the two-finger method, it is necessary to place the index and middle fingers on the compression site perpendicular to the surface of the chest and press.

During pressure on the sternum, only the fingertips should touch the compression area (Fig. 12).



Right **Wrong**

Fig. 12. **Right and wrong pressure with two fingers.**

The duration of the pressure period should be somewhat shorter than decompression, in which case the maximum cardiac output will be ensured.

Fingers should not be torn off the surface of the chest in the interval between pressures (Fig. 13).

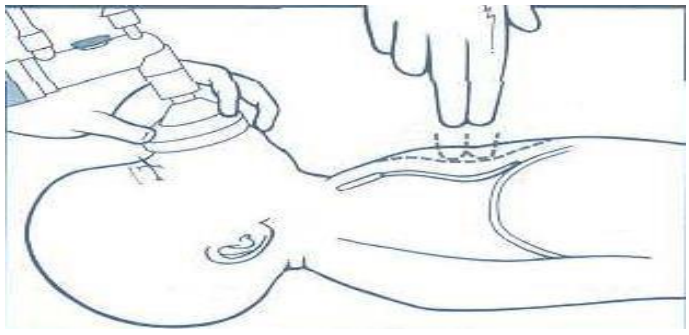


Fig. 13. **Error during indirect heart massage - detachment of fingers from the surface of the chest.**

The depth of compression depends on the size of the child. It is necessary to press on the sternum with a force that will ensure retraction of the sternum to a depth equal to approximately 1/3 of the anteroposterior diameter of the chest. (Fig. 14).

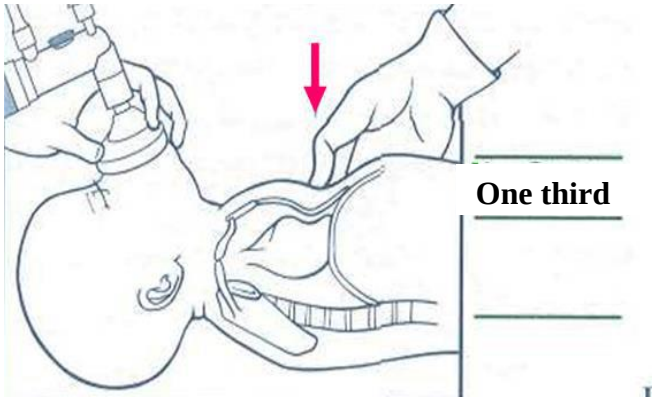


Fig. 14. **Determination of the depth of compression.**

Indirect massage will be of little use if ventilation is not carried out simultaneously with oxygen. In this regard, to perform an indirect heart massage, two people are needed: one to compress the chest, the other to continue ventilation. A specialist who performs cardiac massage should have free access to the chest and the ability to properly put his hands on it.

The resuscitator who conducts ventilation should stand in front of the child's head to ensure effective contact between the mask and face and to be able to follow the movements of the chest. (Fig. 15).

Fig. 15. **The correct position of resuscitators.**

However, compression and ventilation should not be used simultaneously during cardiopulmonary resuscitation, because they reduce each other's effectiveness. It is necessary to carry out ventilation after every third pressure on the sternum, i.e., perform 30 ventilation and 90 compressions in 1 min.

The doctor who performs the cardiac massage should coordinate the procedures, loudly counting: "One-and-Two-and-Three-and-Breathe-in." At the expense of "Breathe-in" the person who is responsible for ventilation, squeezes the bag, and on the "One and" - releases it. Passive exhalation occurs with the next pressure on the sternum.

Thus, one cycle of action consists of three compressions and one ventilation. A cycle of four actions should take about 2 seconds, i.e., approximately 120 actions (90 pressings and 30 ventilation) are performed in about 1 minute.

After 30 seconds of coordinated indirect heart massage and ventilation, it is necessary to stop indirect heart massage at the time of determining heart rate. If the pulse can be palpated at the base of the umbilical cord, then you do not need to stop ventilation, if not, then the resuscitator will have to interrupt both procedures for a few seconds to listen to the chest with a stethoscope.

After indirect heart massage and lung ventilation for 60 seconds.

Heart Rate:

If heart rate is more than 60 beats / min, stop indirect heart massage and continue ventilation of the lungs with a frequency of 40-60 forced breaths per minute.

The heart rate becomes more than 100 beats per minute to stop the indirect heart massage and, when the child develops independent breathing, gradually stop the forced lung ventilation under positive pressure.

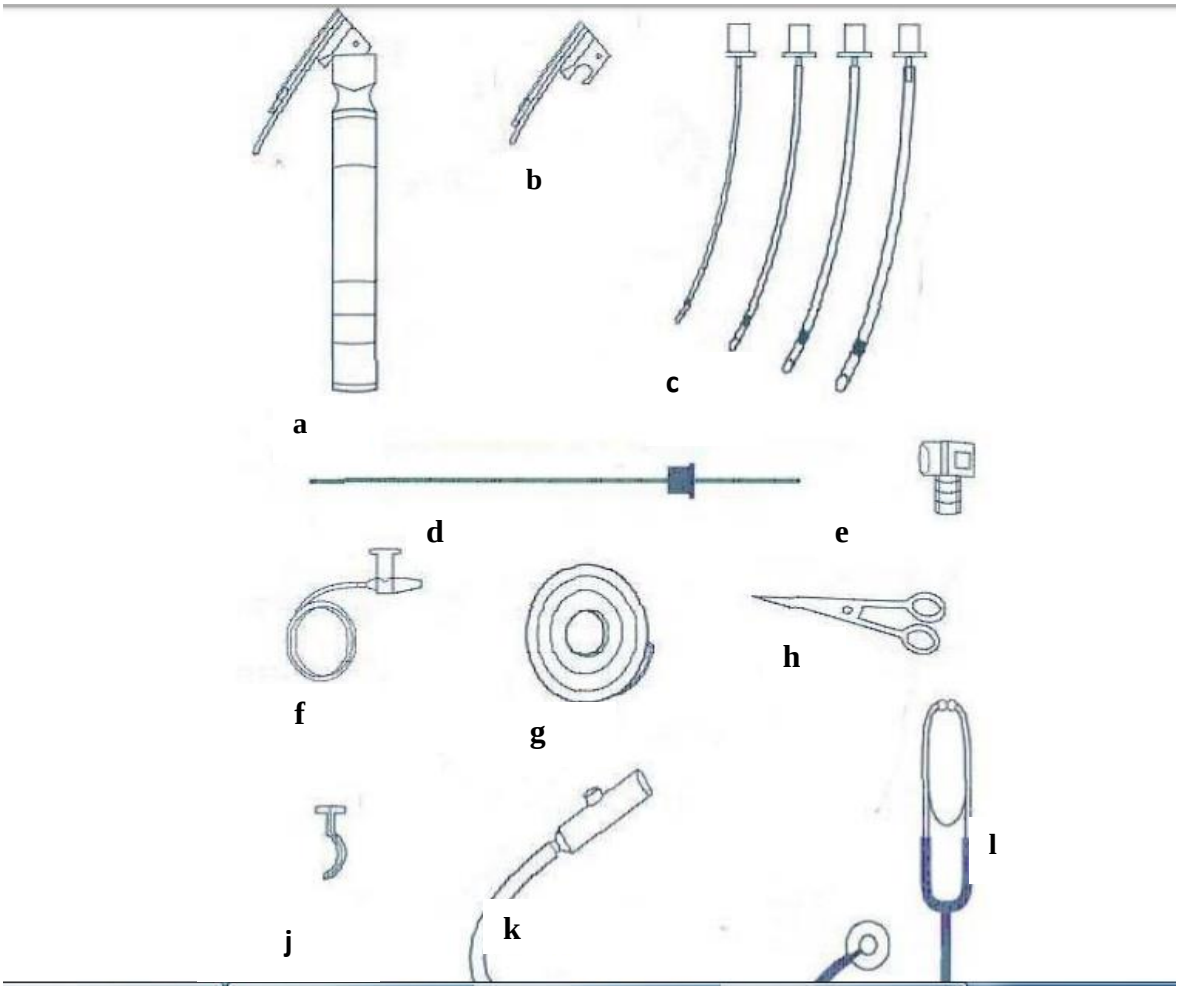
Heart rate less than 60 beats per minute - after 60 seconds of effective indirect heart massage and ventilation, perform tracheal intubation.

Indications for intubation :

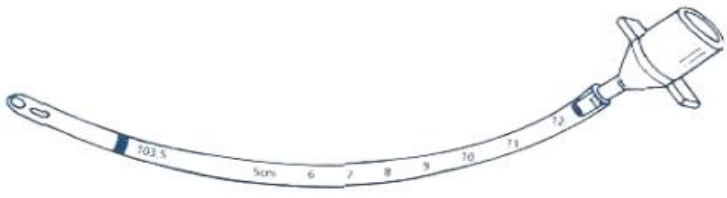
- birth of a child in asphyxia;
- deep prematurity;
- the introduction of surfactant intratracheal;
- suspicion of diaphragmatic hernia;
- ineffective ventilation mask.

The equipment and materials necessary for tracheal intubation are as follows:

1. Laryngoscope (Fig. 16,a).
2. Blades (Fig. 16, b): No. 1 (for full-term newborns), №0 (for premature newborns), № 00 (preferably for extremely premature).
3. Endotracheal tubes with an inner diameter of 2,5 ; 3;3,5 and 4mm (Fig.16,c).
4. A stylet (conductor) is desirable (Fig. 16, d).
5. A monitor or a CO2 detector is optional (Fig. 16, e).
6. Suction with a 10 F or large-diameter catheter and 5 F or 6 F catheters for suction from the endotracheal tube (Fig. 16f).
7. Adhesive plaster or fixative endotracheal tube (Fig. 16, g).
8. Scissors (Fig. 16, h).
9. Airduct (Fig. 16, j).
10. Meconiumaspirator (Fig. 16, k).
11. A stethoscope (Fig. 16, l).



It is necessary to use sterile disposable endotracheal tubes. They should have the same diameter along the entire length and not taper at the end (Fig. 16).



***Fiq. 16.*Intubation tube.**

For most neonatal endotracheal tubes near their trachea have a black line called the glottis mark. After insertion, the label should be at the level of the vocal

cords. Usually this allows you to place the end of the tube over the bifurcation of the trachea. The size of the endotracheal tube is determined in accordance with the body weight of the child (table. 5).

The depth of the endotracheal tube should always be checked by comparing the marks on the tube with the formula (mark at the corner, see = 6 cm + newborn's body weight).

Table. 5.

The size of the endotracheal tube and the depth of its introduction.

Gestation period	Body mass	EET size	Depth of insertion from the angle of the mouth
<28	<100	2,5	6-7
28-34	1000-2000	3,0	7-8
34-38	2000-3000	3,5	8-9
> 38	> 3000	3,5-4	9-10

Tracheal Intubation Standard

Intubation should be performed by a doctor who has undergone resuscitation training and has intubation skills.

Key points

- The correct position of the child on the horizontal, the head in the midline, slightly thrown back (in the “sniffing” position), roller under the shoulders;
- Find the epiglottis - necessary for the movement of the laryngoscope in depth;

Performing bimanual laryngoscopy with the movement of the thyroid cartilage on the right side helps to see the glottis.

Intubation Technique:

- Check the health of the laryngoscope
- Anesthesia
- Correctly lay the child: head in the midline in a moderate extension position (sniffing position)
- The laryngoscope is always in the left hand. Do not change your hand!
- Open your mouth with the index finger of your right hand, enter the blade through the right corner of the mouth, while moving the tongue to the left, moving forward until the epiglottis appears in the field of vision.
- With the tip of the blade, lift the epiglottis to the soft palate until the vocal cords are visualized.
- To improve visualization of the entrance to the larynx, press the little finger of the left hand on the larynx from the outside
- If the vocal cords are closed, wait for the moment of opening.
- With your right hand, along the edge of the blade, insert the endotracheal tube into the glottis until the black mark disappears.
- Perform auscultation of breathing (Ambu bag or ventilator)
- Fix the tube with a band-aid first to the skin, then the tube.
- Continue ventilation under heart rate and SPO 2
- Provide transportation to PIT.

The tracheal intubation procedure should take no more than 30 seconds !!!

The depth of the endotracheal tube should always be checked by comparing the marks on the tube with the formula (mark at the corner, see = 6 cm + newborn's body weight) or table 3.

Criteria for the correct position of the endotracheal tube

- Fogging of the inner wall of the tube
- Symmetrical chest movement with each breath

• Heart rate increase above 100 beats / min

• Improving oxygen saturation (pulse oximetry is more accurate than visual assessment)

• The presence of CO 2 in the air. (With low cardiac output and the absence of blood flow in the vessels of the lungs, the results may be false negative).

• On one attempt at unsuccessful intubation, the tube should be removed and the IVL should be continued using a bag and mask to stabilize heart rate and skin color, and then repeat the tracheal intubation procedure

The length of the tube should be 13-15 cm, which will provide a sufficient protrusion above the lip level (Fig. 17).

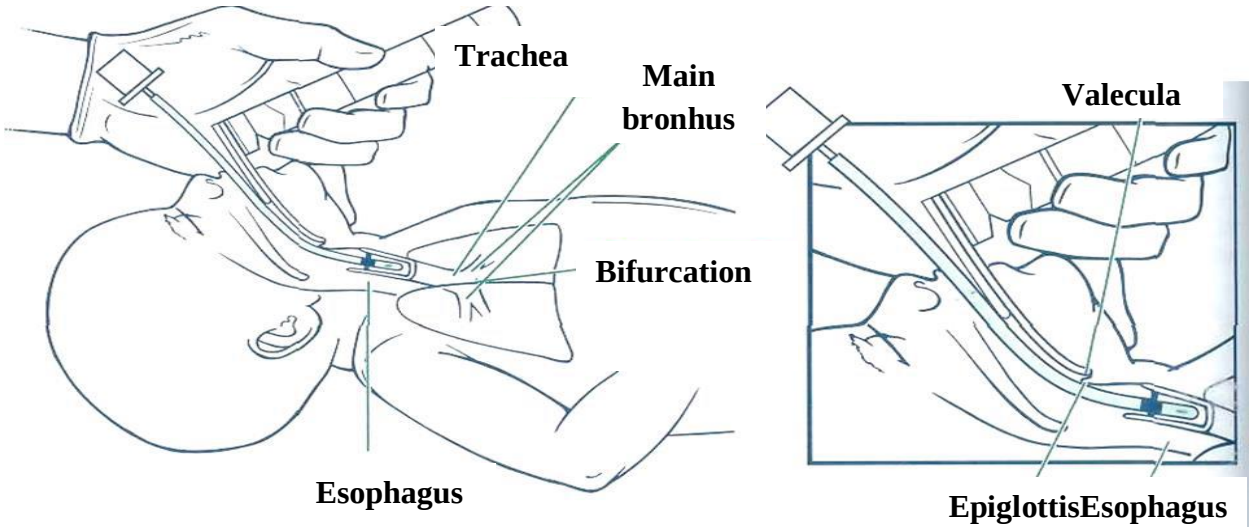


Fig. 17. Technique for intubation of the trachea.

To facilitate intubation as much as possible, it is necessary to give the child the same position as with ventilation with a bag and mask: lay on a flat surface, fix the head in the midline and stretch the neck moderately. A roller can be placed under the shoulders (so that the head is moderately bent).

The laryngoscope should be held (after turning on the light on it) in the left hand between the thumb and the next two or three fingers, directing the blade away from you (Fig. 18).

***In order to fix the glottis in the field of view, it is necessary*:**

1. Fix the baby's head with his right hand (Fig. 19). Throughout the procedure, apply a free flow of oxygen.

2. Guide the blade of the laryngoscope along the right edge of the tongue, pushing it to the left half of the mouth, and advance the blade until its end falls into the groove (valecula) immediately behind the base of the tongue.

3. Raise the blade slightly, holding the tongue up and opening the way to the throat.

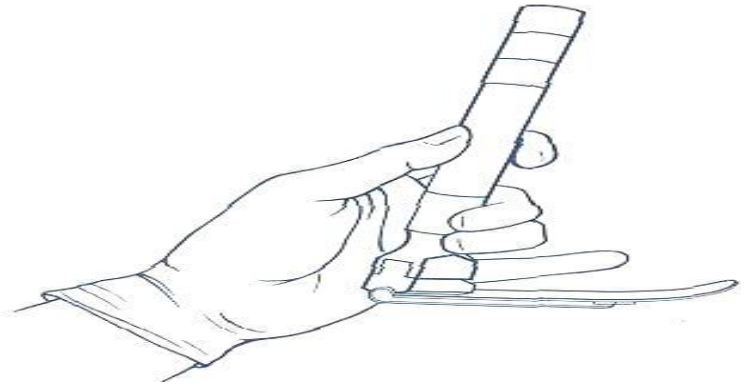


***Fig. 18.* Correct capture of a laryngoscope.**

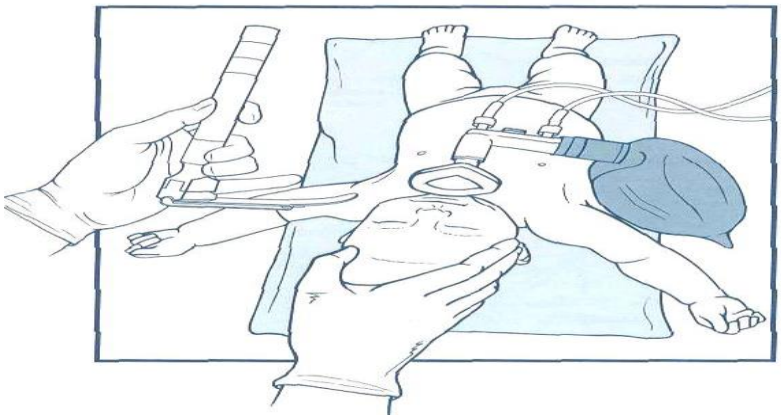
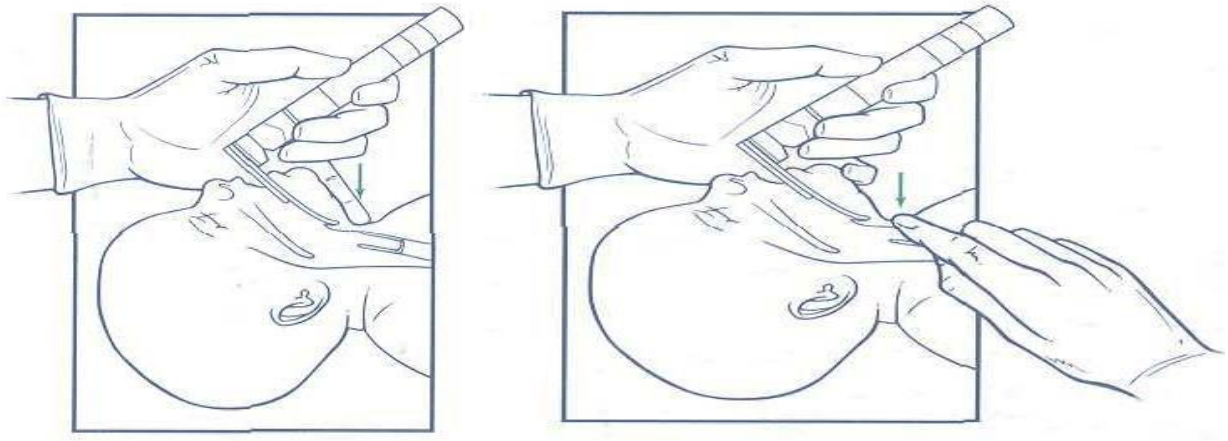


***Fig. 19.* The correct position of the child with intubation of the trachea.**

You should not lift the end of the blade with swinging movements, pulling the handle of the laryngoscope onto itself. Such movements will not provide the desired visible access to the glottis and will put additional pressure on the alveolar processes, which may disrupt the formation of the child’s teeth in the future.

Pressing on the cricoid cartilage, which covers the larynx, helps to see the glottis (Sellick's technique). The doctor (little finger), who conducts the intubation, or his assistant, can press it (Fig. 20).



a ***b***

Fig. 20. **Providing a better view of the glottis by pressing the larynx: a - by a doctor who intubates; b - an assistant.**

Holding the tube with your right hand, you must enter it into the right corner of the mouth of the newborn. So it will not interfere with the examination of the glottis. The gap should be kept in sight and at the moment of opening the vocal cords, insert the end of the endotracheal tube into the trachea. Do not touch the closed ligaments with the end of the tube, since this can cause a spasm, you must wait for them to open. If the ligaments do not open within 20 seconds, stop intubation and begin ventilation of the lungs with a bag and mask. After increasing heart rate and improving skin color, you can repeat the attempt to intubation.

You need to enter the handset only until the mark of the glottis stops at the level of the vocal cords. This will ensure that the end of the tube in the trachea is approximately in the middle between the vocal cords and the bifurcation.

Next, you need to stretch the laryngoscope. To do this, hold the tube firmly with the right hand near the lips of the child or press it with your finger to the sky, and carefully remove the laryngoscope (Fig. 21) with the left hand carefully, without changing the position of the tube.

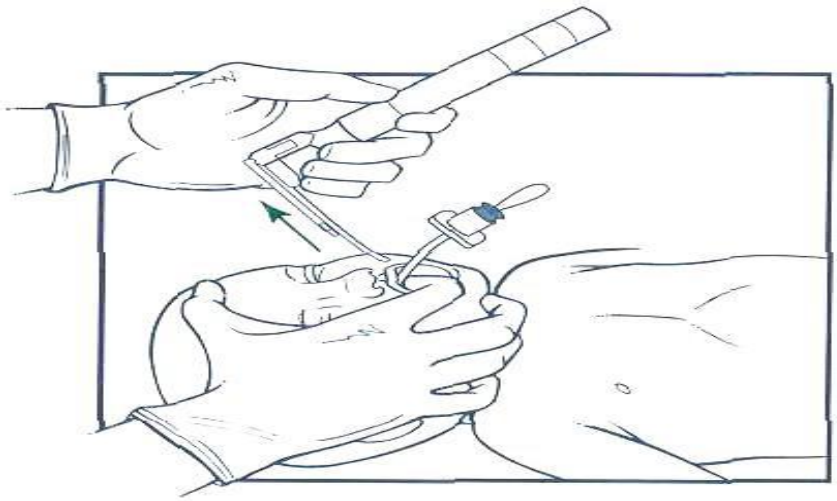


Fig. 21. **Removing the laryngoscope.**

Signs of proper tube insertion are as follows:

- visible movements of the chest during each ventilation;

- breathing sounds are heard over both lungs, but the sound of air entering the stomach is not heard;

- there are no signs of progressive distention of the stomach during ventilation;

- Condensation of steam is visible in the middle of the tube when the child exhales.

The wrong position of the tube is worse than its absence!

The tube is most likely not located in the trachea, but in the esophagus, if there are the following symptoms:

- there are no excursions of the chest;

- respiratory noises over the lungs are poorly conducted;

- you hear the noise of air movement over the stomach;

- there is no condensation in the tube;

- the stomach begins to increase;

- the monitor does not show the presence of exhaled CO2;

- despite ventilation under positive pressure, the newborn retains cyanosis and bradycardia.

If there is a suspicion that the tube is inserted into the esophagus, you should:

- holding it with your right hand, with the left, re-enter the laryngoscope blade to see the glottis and determine if the tube passes between the vocal cords;
- if the tube is in the correct position, extend it, ventilate with a bag and a mask to stabilize heart rate and improve skin color, and then repeat the intubation procedure.

The signs of a tube in the right main bronchus (the tube is inserted too deep) are as follows:

- breathing noises are heard only over the right half of the chest;
- breathing on the right is a little louder than on the left;
- skin color does not improve or heart rate does not increase (Fig. 22).

If the tube is inserted too deep, pull it up a little.

The depth of introduction of the endotracheal tube (the distance from the end of the tube to the red border of the upper lip) depends on the body weight of the child: with a weight of 1 kg, the depth is 7 cm; 2 kg - 8 cm; 3 kg - 9 cm; 4 kg - 10 cm. It can be calculated by the formula m + 6, where m is the child's weight (kg). To control the depth of introduction of the endotracheal tube, an x-ray of the chest organs is necessary.

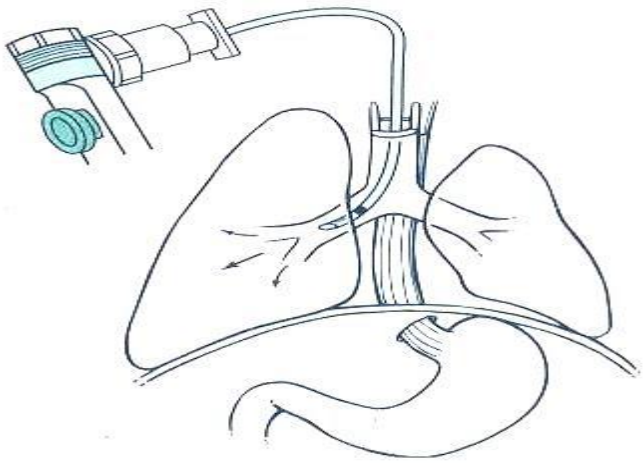


Fig. 22. **Finding a tube in the right main bronchus.**

RESUSCITATION PRINCIPLE D

Principle D (DRUGS) is the use of drugs. If the heart rate of the newborn remains less than 60 per minute after auxiliary ventilation for 30 s and additional coordinated indirect heart massage with ventilation for 30 s, then adrenaline is indicated.

Medicines used in the primary resuscitation of newborns

Table. 6.

A drug	**The concentration of the injected solution**	**Dose / route of administration**	**Feature Introduction Speed**
Epinephrine (Adrenalin)	1:10 000	0,01-0,03 mg/kg iv 0,1-0,3 ml/kg iv 0,05-0,1 mg/kg in ETG 0,5-1,0 ml/kg in ETG	Injection can be repeated after 3-5 minutes
A solution of NaCl , ringer's solution of lactate	0,9%		Enter in 3-5 minutes, can be repeated after 5-10 minutes

Adrenaline hydrochloride is a pacemaker that increases strength and heart rate, but also causes peripheral vasospasm. Adrenaline is not indicated until effective ventilation is established, since its administration is pointless until the air-oxygen mixture is actively pumped into the lungs. In addition, adrenaline increases the load on the heart and oxygen consumption by the myocardium, which, in conditions of its deficiency, can cause a violation of the heart muscle.

Adrenaline must be administered in the most accessible way, which will ensure the flow of the drug to the myocardium. The myocardium is supplied with

blood from the coronary arteries located directly behind the left ventricle, so adrenaline must enter the blood, which quickly reaches the heart.

The most affordable routes for administering adrenaline are as follows:

- through the endotracheal tube. Adrenaline, administered endotracheally, is absorbed into the bloodstream of the pulmonary veins, which flow directly into the heart. However, in this case, the effect is slower than when the drug was injected directly into the blood, because it takes time to absorb the drug in the lungs;
- through a catheter into a cord vein. Adrenaline enters the inferior vena cava, which flows into the right atrium. This route of administration of adrenaline is more effective, because the desired concentration of the substance is achieved faster, but with this route of administration, additional time is spent on catheterization of the vessel.

The introduction of adrenaline through the endotracheal tube can be carried out in two ways:

- directly into the endotracheal tube, as a result of which, through ventilation under positive pressure, the drug is distributed in the lungs;
- through a 5 F gastric tube inserted into the endotracheal tube. This method allows the resuscitator to be sure that adrenaline enters the lungs, and does not settle on the walls of the tube and its collectors (because the tube is relatively large, you can use 0,5-1 ml of an isotonic solution to flush the drug from the walls) . After administration of adrenaline, the probe is removed and ventilation is continued under positive pressure. Adrenaline must be diluted with an isotonic solution in a ratio of 1: 10, i.e., 1 ml of 0,1% adrenaline needs to be added with 9 ml of isotonic solution, as a result of which 0,01% adrenaline will be obtained.

Indications for use:

- A heart rate of less than 60 beats in 1 min after ventilation of the lungs with 100% oxygen with indirect heart massage for 60 seconds.
- Lack of heart contractions (asystole) at any moment of resuscitation.

- Epinephrine is administered as quickly as possible in / in a dose of 0,1-0.3 ml/kg of solution at a concentration of 1:10000, followed by the administration of 0,5-1,0 ml of physiological saline.
- Or an endotracheal dose of epinephrine 0,5-1,0 ml/kg once, if there is no venous access.
- After the introduction of adrenaline into the trachea, it is important to immediately carry out several effective ventilation under positive pressure.
- Continue indirect heart massage. Assess your heart rate every 30 seconds. If there is no effect, repeat epinephrine administration every 3-5 minutes. Repeated injections only i/v. Big doses of i/v epinephrine for resuscitation of newborns are not recommended, since their administration can cause damage to the brain and heart of the child.

Funds normalizing BCC:

- 0,9% sodium chloride solution.
- Ringer's solution of lactate.

Indications for use:

- The lack of reaction of the child to resuscitation.
- The child is in a state of shock (pallor of the skin, pulse of poor filling, persistent bradycardia, lack of signs of improved blood circulation, despite all resuscitation measures).
- There is anamnesis evidence of fetal blood loss (profuse uterine bleeding, placenta previa, feto-fetal transfusion, etc.).
- The initial dose of the volemic solution is 10-20 ml / kg, it is administered slowly, in a jet, over 5-10 minutes. The same dose can, if necessary, be repeated after 10 minutes.

The technique for umbilical vein catheterization is as follows:

1. Under sterile conditions, cut the umbilical cord with a scalpel below the dressing at a distance of 1-2 cm from the umbilical ring. The cut should be done perpendicular to the umbilical cord, not at an angle

2. Place a loose ligature on the umbilical cord.

3. Introduce a catheter filled with an isotonic solution into the umbilical cord vein. The umbilical cord vein looks like a large thin-walled structure, located at 11-12 hours of the dial. In the two arteries of the umbilical cord, the walls are thicker, and, as a rule, they lie one near the other in the zone of 4-8 hours. The vein of the umbilical cord goes up to the heart, so the catheter must also be advanced in this direction.

4. Continue introducing the catheter to a depth of 2–4 cm, pulling the piston out of the syringe until there is free blood flow from the vessel (Fig. 23).

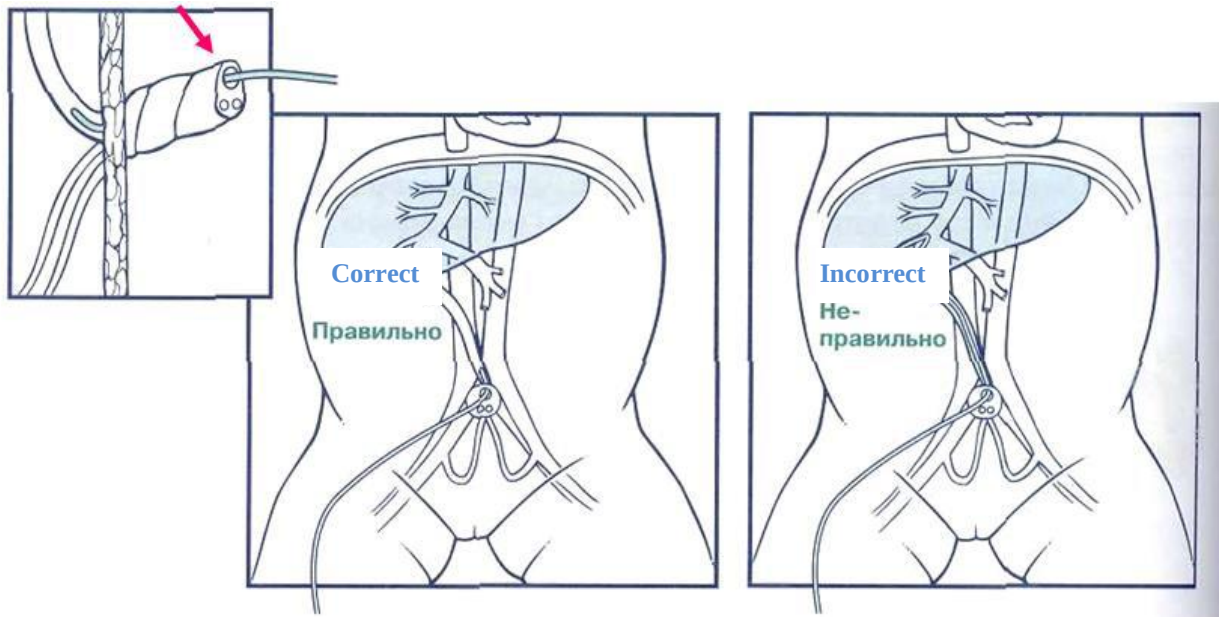


Fig. 23. **Cord vein catheterization.**

End of resuscitation.

If the child does not detect heart contractions (asystole) within 10 minutes against a background of continuous and adequate resuscitation, resuscitation should be discontinued.

SELF-CONTROL OF TOPIC ACCEPTANCE

1. Before the birth of the alveoli in the fetal lungs:

a) in a state of collapse; c) filled with liquid;

b) straightened; d) filled with air.

2. After birth, the child's energetic breathing efforts promote absorption from the lungs:

a) oxygen; c) pulmonary fluid;

b) carbon dioxide; g) nitrogen.

3. After the expansion of the alveoli of the lungs in the newborn:

a) pulmonary arterioles expand;

b) pulmonary arterioles narrow;

c) the lumen of the pulmonary arterioles does not change.

4. A child who breathes actively, has a pink skin color, has no meconium residues on the skin and was born after the passage of light near the fetal waters, in the events of primary resuscitation:

a) needs; b) does not need.

5. A newborn with low muscle tone and a risk of meconium aspiration in direct laryngoscopy and suction of the contents of the trachea through the endotracheal tube:

a) needs; b) does not need.

6. The correct position of the head but congenital for suction:

a ***b*** ***c***

7. The correct methods for tactile stimulation of a newborn:

a) pat on the back; c) pat on the soles;

b) rubbing the back; g) compression of the chest.

8. If the child is in a state of secondary apnea, tactile stimulation in itself:

a) will stimulate breathing;

b) will not stimulate breathing;

c) will stimulate the independent movements of the child.

9. If after tactile stimulation the newborn still does not breathe, it should:

a) continue additional stimulation;

b) start ventilation of the lungs under positive pressure;

c) start an indirect heart massage.

10. If the child breathes, but cyanosis persists, the following initial steps must be completed:

a) put it under a heat source;

b) suck the contents of the mouth and nose;

c) dry and stimulate;

d) pick up all wet diapers;

e) give a free flow of oxygen.

11. The newborn was born with traces of meconium on the skin, but breathes well, has a pink color, normal muscle tone and a heart rate of 120 per minute. The correct actions:

a) laryngoscopy and suction of contents from the trachea using an endotracheal tube;

b) suctioning the contents from the mouth and nose with a pear or catheter;

c) ventilation of the lungs under positive pressure.

12. The newborn does not breathe and is cyanotic . His respiratory tract was released and tactile stimulation was performed. 30 s after birth no clinical improvement. The next step:

a) continue tactile stimulation;

b) start ventilation under positive pressure;

c) intubate the trachea.

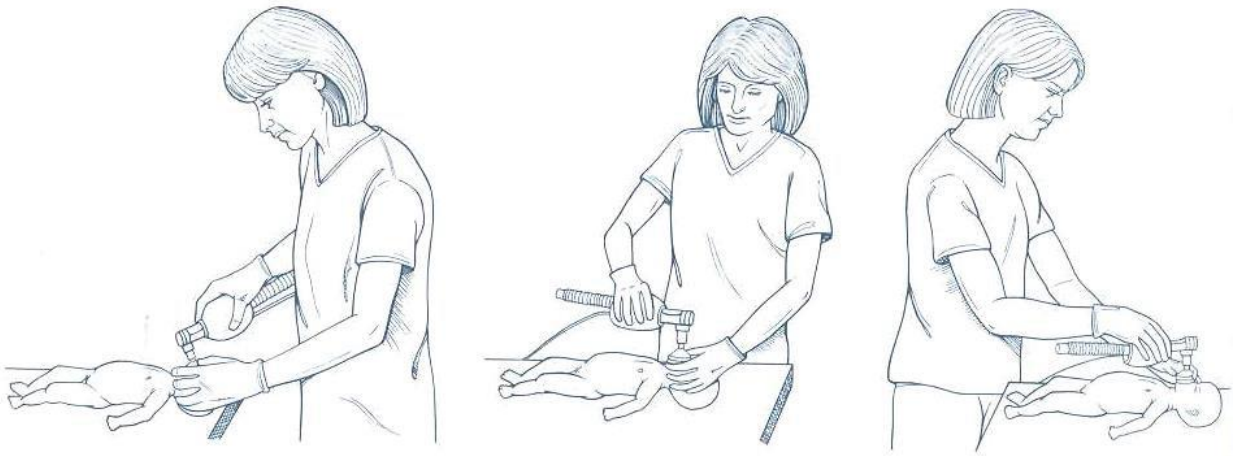
13. Properly sized mask:

a b c

14. Correct position for ventilation with resuscitation bag:

a b c

15. The correct position of the medical worker during the assisted ventilation resuscitation bag:



a b c

16. During ventilation of the child, the resuscitation bag must be compressed with a frequency of:

a) 10-20 per minute; c) 40-60 per minute;

b) 20-30 per minute; d) 80-100 per minute.

17. The approximate depth of insertion of the orogastric tube is:

a) the distance from the earlobe to the xiphoid process of the sternum;

b) the distance from the nose to the earlobe and from the earlobe to the xiphoid process of the sternum;

c) the distance from the nose bridge to the earlobe.

18. To coordinate the time of the indirect massage of the heart and veins of ventilation helps the phrase:

a) “One-and-Two-and-Three-and-Breathe”;

b) "Inhale-Exhale-Inhale-Exhale";

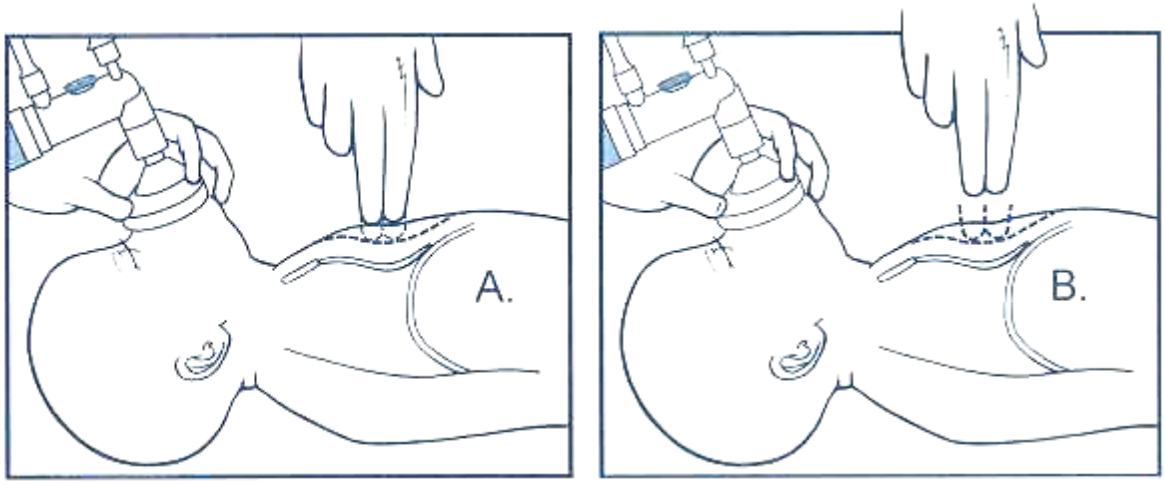
c) One-and-In-Two-and-In”;

d) "One-Two-Three-Four."

19. The correct ratio between the number of compressions and ventilation:

a) 1 to 1; b) 2 to 1; c) 3 to 1; d) 4 to 1.

20. The correct decompression method is:



a b

21. During ventilation under positive pressure simultaneously with an indirect heart massage, the total number of actions (compressions and ventilation) per minute should be:

a) 60; c) 120; b) 90; d) 180.

22. The newborn did not respond to ventilation and indirect cardiac massage, and its condition requires the administration of adrenaline to stimulate cardiac activity. Available methods of administering adrenaline in this situation:

a) directly into the trachea through an endotracheal tube;

b) directly into the trachea through an orogastric tube;

c) into the vein of the umbilical cord through a catheter.

23. Performing tracheal intubation should not last longer:

a) 10 s; c) 30 s;

b) 20 s; d) 40 s.

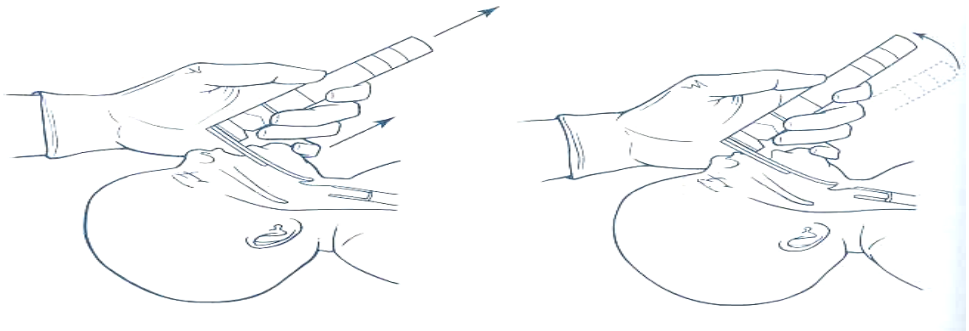
24. If the first attempt to intubate the trachea within the time specified in the previous question failed, you must:

a) continue intubation attempts until success is achieved;

b) stop intubation and carry out auxiliary ventilation with a bag;

c) start an indirect heart massage.

24. The correct way to raise your tongue to see the area of the pharynx:



a b

26. An endotracheal tube was inserted into the newborn and ventilation was performed through it under positive pressure. During auscultation with a stethoscope, breathing is carried out symmetrically with the same intensity on both sides of the chest of the child. No noise is also heard of air entering the stomach. The endotracheal tube is suspected to be:

a) in the esophagus; b) trachea; c) the right main bronchus.

27. An endotracheal tube was inserted into the newborn and ventilation was performed through it under positive pressure. During auscultation with a stethoscope the assistants cannot hear breath sounds on either side chest-stand, and above the stomach auscultated air movement. The endotracheal tube is presumably located:

a) in the esophagus; b) trachea; c) the right main bronchus.

28. An endotracheal tube was inserted into the newborn and ventilation was performed through it under positive pressure. During auscultation, breathing noises are heard on the right side of the chest, but are not heard on the left. When checking the depth of tube insertion, it is found that it is larger than necessary. It is necessary:

a) remove the endotracheal tube;

b) push the endotracheal tube deeper;

c) slightly tighten the endotracheal tube up;

d) carry out auscultation after changing the position of the tube.

29. Anatomical and physiological characteristics of newborns, important for tracheal intubation:

a) a relatively large language;

b) short neck;

c) high location of the larynx;

d) thin skin;

e) a relatively short trachea.

30. If the heart rate of the newborn remains less than 60 per minute, then you can repeat the introduction of adrenaline every:

a) 10 s; b) 30 s; c) 1 min; d) 5 min.

LITERATURE

1. "Guidelines on basic newborn resuscitation." WHO 2012, http: // www.who.int/about/licensing/copyright_form/en/index.html).
2. “Neonatal Resuscitation: 2010 American Heart Assosiciation guidelines for Cardiopulmonary Resusitation and Emergency Cardiovascular Care” AAP, Pediatrics 2010, 128, 176.
3. “Neonatal Resuscitation” Queensland Maternity and Neonatal Clinical Guidelines, 2011 http://www.health.qld.gov.au/qcg
4. “Primary and resuscitation care for newborns”, approved by the Ministry of Health and Social Development of the Russian Federation in 2010 (PiRPN, 2010).
5. Clinical protocols for neonatology: Issue. 1. - B.: 2010. - 147p.
6. EPU - WHO , JSI, USAID. P. 2N -2 -2 N16.
7. Neonatal resuscitator / Newborn-Reusable / Directions for use.
8. Paediatric Heart Center, Childrens Hospital of FudanUniversaty, Shanghai, China, 2014 http.
9. R. Roos, Neonatology, practical recommendations per. with him, R. Roos. O. Gentsel-Borovichi, G. Prokitte 2011. - 592 p.: Www.
10. www.leardal.com Manufactured by Leardal Medical AS, Tanke Svilandsgate 30P.O. Box 377, 4002 Stanvanger Norway.

TABLE OF CONTENTS

FOR NOTES